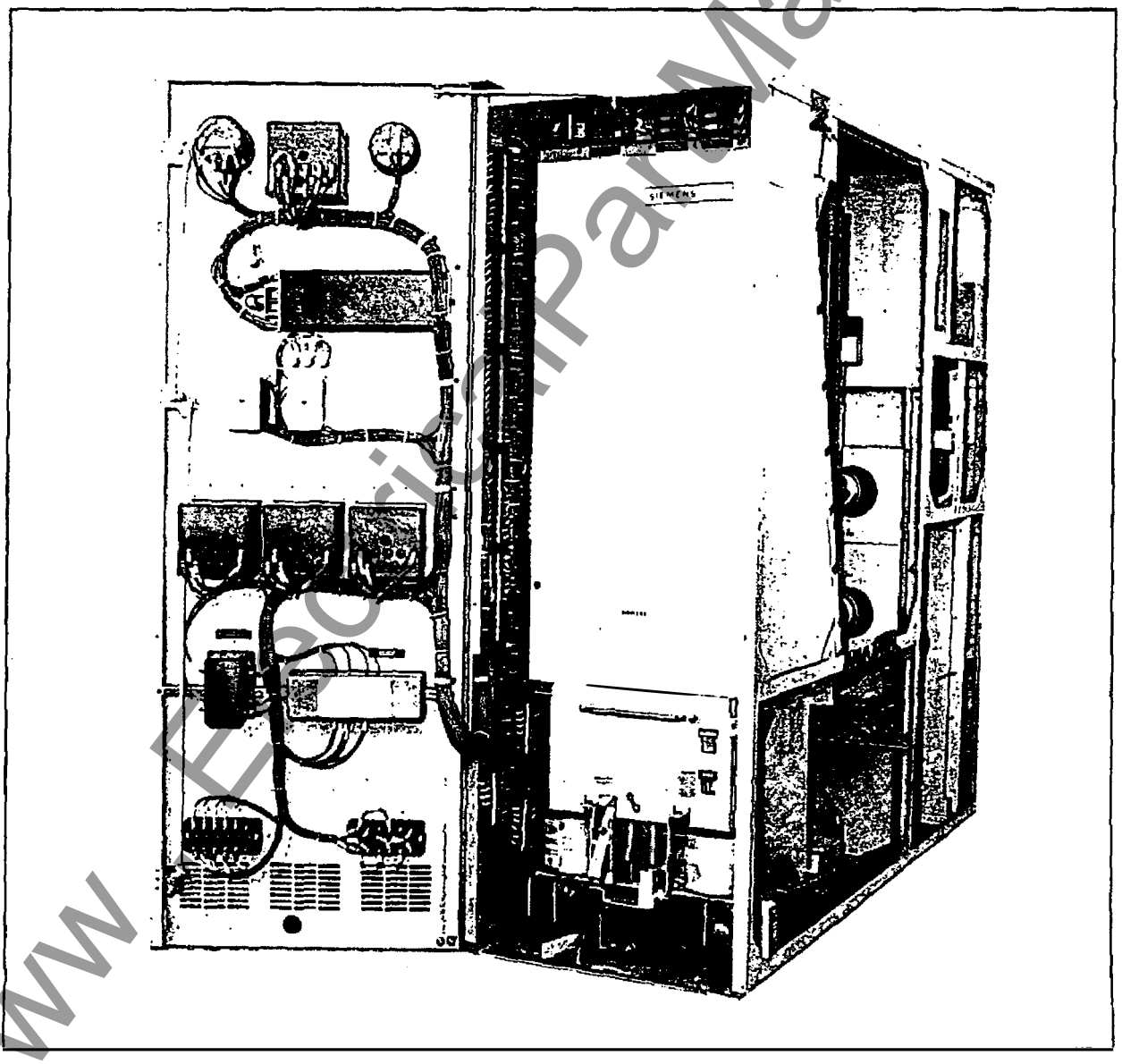
SIEMENS

5kV Air Magnetic Circuit Breakers

MA-75C1, MA-250C1 and MA-350C1

Instructions
Installation
Operation
Maintenance
Parts
SG3188-01



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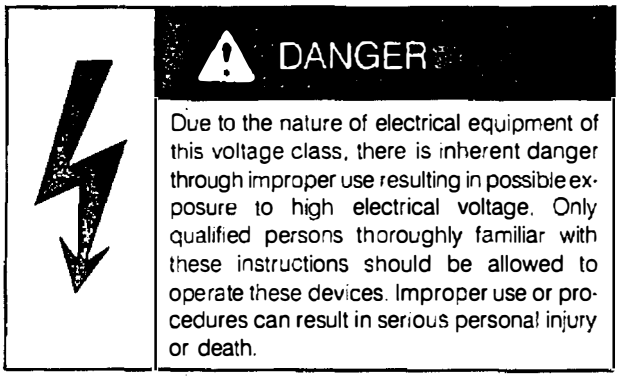
The information contained within is intended to assist operating personnel by providing information on the general characteristics of equipment of this type. It does not relieve the user of responsibility to use sound engineering practices in the installation, application, operation and maintenance of the particular equipment purchased.

If drawings or other supplementary instructions for specific aplications are forwarded with this manaul or separately, they take precedence over any conflicting or incomplete information in this manual.

Illustrations

This instruction manual contains installation, operation and maintenance information for Types MA-75C1, MA-250C1 and MA-350C1 stored energy operated, 5-kV air magnetic circuit breakers.



⚠ DANGER

Due to the nature of electrical equipment of this voltage class, there is inherent danger through improper use resulting in possible exposure to high electrical voltage. Only qualified persons thoroughly familiar with these instructions should be allowed to operate these devices. Improper use or procedures can result in serious personal injury or death.

Field Service Operation

Siemens can provide competent, well-trained Field Service Representatives to provide technical guidance and advisory assistance for the installation, overhaul, repair and maintenance of Siemens equipment, processes and systems. Contact regional service centers, sales office or factory for details.

Storage

Indoor — The circuit breaker should be installed as soon as possible. If storage is necessary, it should be kept in a clean dry place where it will not be exposed to dirt, corrosive atmospheres or mechanical abuse.

Outdoor — Outdoor storage of circuit breakers is not recommended. If breakers must be stored outdoors, they must be covered completely and a heat source provided to prevent condensation and subsequent corrosion.

If the circuit breaker must be stored for some time, "As Found" test are desirable. (See page 25.)

Description

A typical circuit breaker consists of primary disconnect, arc chute, and operator sections. The primary disconnect section contains the main contacts, which supply power to the load. The arc chute section dissipates the power arc drawn during the opening of the main contacts. The operator section contains the mechanism used to close and open the main contacts. This mechanism consists of a stored energy operator with its associated control circuitry.

Arc Interruption

Arc interruption is accomplished in free air at atmospheric pressure with the aid of a self-induced, magnetic blowout field and forced air draft. When the trip solenoid is energized, load current is being carried by the main contacts. As the contacts open, the main contacts part first and the current is transferred to the arcing contacts. When the arcing contacts part, an arc is established between them.

The arc between the arcing contacts is transferred to the arc runners as the arcing contacts open. The transfer of the arc to the arc runner establishes full current flow through the blowout coils, setting up a strong magnetic field. The magnetic field, accompanied by the natural thermal effects of the heated arc, tends to force the arc upward into the barrier stack. The cool surfaces of the barrier stack cool and de-ionize the arc, while the V-shaped slots in the stack reduce its cross-section and elongate it, leading to rapid extinction. The arc runners are made of wide, heavy material for maximum heat dissipation and for minimum metal vaporization.

A puffer mechanism provides a forced air draft through the main contact area. This aids the magnetic blowout field and natural thermal effects in forcing the arc into the barrier stack for easy extinction.

Siemens warrants title to the product(s) and, except as noted below with respect to items not of Siemens's manufacture, also warrants the product(s) on date of shipment to Purchaser, to be of the kind and quality described herein, merchantable, and free of defects in workmanship and material.

This warranty is expressly in lieu of all other warranties, including but not limited to implied warranties of merchantability and fitness, and constitutes the only warranty of Siemens with respect to the product(s).

If within one year from date of initial operation, but not more than eighteen months from date of shipment by Siemens of any item of product(s), Purchaser discovers that such item was not as warranted above and promptly notifies Siemens in writing thereof, Siemens shall remedy such nonconformance by, at Siemens's option, adjustment or repair or replacement of the item and any affected part of the product(s). Purchaser shall assume all responsibility and expense for removal, reinstallation, and freight in connection with the foregoing remedies. The same obligations and conditions shall extend to replacement parts furnished by Siemens hereunder. Siemens shall have the right of disposal of parts replaced by it.

Any separately listed item of the product(s) which is not manufactured by Siemens is not warranted by Siemens, and shall be covered only by the express warranty, if any, of the manufacturer thereof.

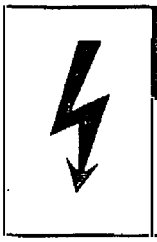
This states purchaser's exclusive remedy against Siemens and its suppliers relating to the product(s), whether in contract or in tort or under any other legal theory, and whether arising out of warranties, representations, instructions, installations or defects from any cause. Siemens and its suppliers shall have not obligation as to any product which has been improperly stored or handled, or which has not been operated or maintained according to instructions in Siemens or supplier furnished manuals.

Receiving

Circuit breakers are shipped from the factory completely assembled. Observe weight markings on crates and ensure that capable handling equipment is used.

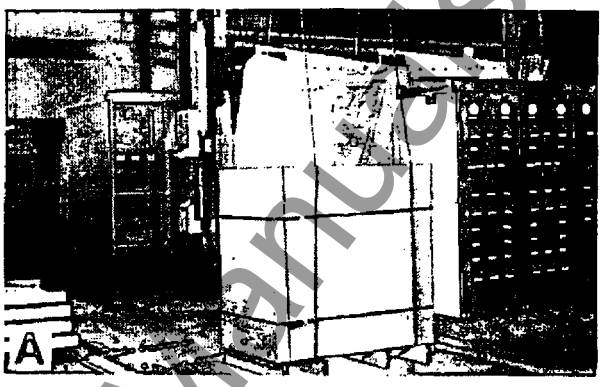
Remove packaging carefully with the correct tools. Check each item with the shipping manifest. If any shortage or damage is found, immediately call it to the attention of the local freight agent handling the shipment. Proper notation should be made by him on the freight bill. This prevents any controversy when claim is made and facilitates adjustment.

When handling breaker (Fig. 1) with a crane or hoist, lifting cables should completely encircle breaker frame. Use a spreader to prevent frame distortion and/or damage to arc chutes. Do not attach lifting hooks, rope, etc., to bushings, insulating parts, fittings, etc. Do not slide breaker off shipping skid without using ramp blocks (T-Shaped pieces provided).

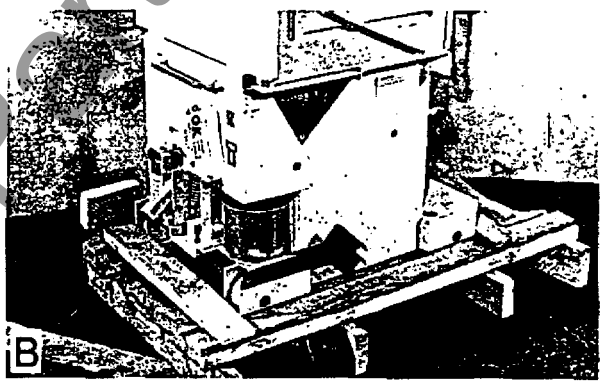


DANGER

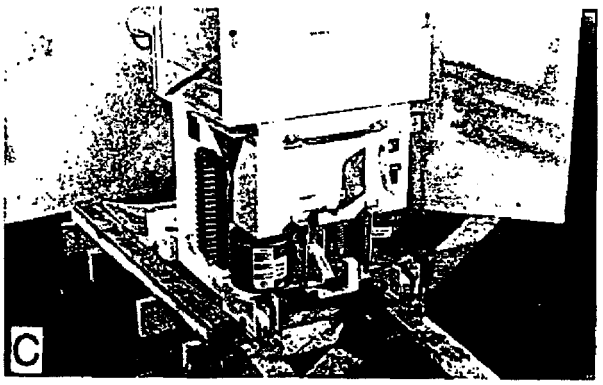
Remove packaging. Breakers are shipped in closed position with the trip rod and foot lever enclosed by packaging to prevent opening during shipment.



Move breaker to location with crane or fork lift. Carefully remove carton and protective plastic cover.



Remove ramp pieces nailed to the pallet at the front and rear of the breaker.



Place ramp pieces in front of the pallet in line with breaker wheels and nail to pallet. Slowly roll breaker off pallet.

Figure 1. Circuit Breaker Handling Instructions

Circuit Breaker Preparation

Prepare the circuit breaker for insertion into its cubicle as follows:

1. Remove Packaging. Note: Breakers are shipped in closed position with the trip rod and foot lever enclosed by packaging to prevent opening during shipment.
2. Push manual trip rod to open breaker.
3. Remove phase barriers and unfasten both front and rear blowout coil connections. (See "Phase Barrier Assembly," page 16.)
4. With arc chute support in place at the rear of the breaker, tilt the arc chutes (refer to page 16 for details) to expose contact area.
5. Remove dust, foreign particles, etc., from breaker.

5A. Inspect ceramics for possible shipping damage.

6. Check for mechanical freedom of disconnect arm movements by slowly closing the breaker. Reference page 20 for Slow Close Procedure.
7. Trip breaker by depressing trip rod.
8. Return arc chutes to upright position, FASTEN BOTH FRONT AND REAR BLOWOUT COIL CONNECTIONS and replace phase barriers. Be sure screws on all phases are tightened securely.
9. Install plug jumper and energize control. (Springs should charge.)
10. Close breaker.
11. Trip breaker.
12. Depress foot lever and close electrically (*).
13. Release foot lever and repeat steps 10 (#) and 11.
14. De-energize control power and remove plug jumper.
15. Coat movable primary and secondary disconnects with a light film of S-A contact lubricant, 15-171-370-002.
16. Insert breaker into its cubicle to "disconnect" position and close manually (*).
17. Complete movement of breaker to "test" position and repeat steps 10 (#) and 11.
18. Check for proper alignment between stationary and movable secondary contacts. Check for proper alignment between auxiliary switch bayonet on cubicle wall and operating fork on breaker.

⚠ DANGER

Before proceeding with step 19 check to insure that line and bus circuits are not energized. Failure to do so may result in electrical shock or burn causing death or serious personal injury and property damage.

19. With line and bus de-energized, rack breaker into fully connected position. Close and trip breaker from main control panel. If bus or line are energized, get clearance before beginning this step.
20. Lock out Kirk interlock (if provided) and repeat step 10 (*).
21. Open interlock and repeat steps 10 (#) and 11.
22. Breaker is now ready for normal operation.

(*) Breaker is trip free.
(#) Breaker will close.

Stored Energy Operator

The stored energy operator uses charged springs to power the closing operation. Opening is spring-powered also, but not with the same springs used for closing. A stored energy operator consists of three systems: spring charging drive, cam and ratchet assembly, and the four bar toggle linkage (Fig. 2, A-D). These systems are disengaged from each other except while performing their specific functions. For example — the spring charging drive and cam-ratchet assembly are disengaged except when the cam-ratchet arrangement is being charged. Similarly, the cam-ratchet and four bar linkage are free of each other except during closing.

Stored energy operated breaker normally require a single commercial replay for control. This relay is furnished to match the control voltage.

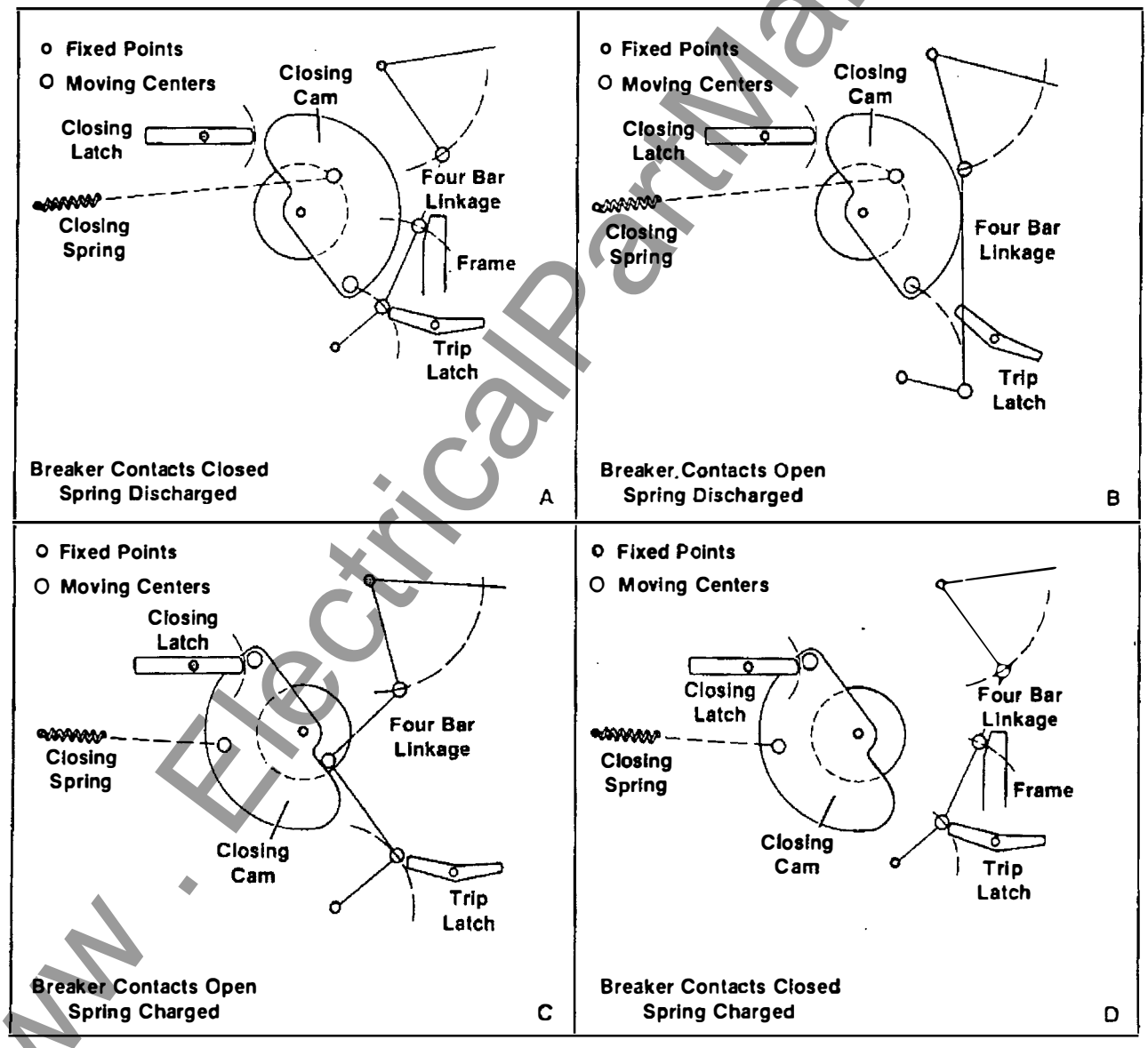


Figure 2. Sequence of Operation

Component Nomenclature

To be used with "Description of Operation" Fig. 3.

1. Spring Charging Motor
2. Driving Pawl
3. Eccentric Drive Shaft
4. Ratchet Wheel
5. Holding Pawl
6. Closing Springs
7. Cams
8. Spring Release Rollers
9. Close Latch
10. Motor Cutoff Switch
11. Linkage Reset Spring
12. Four Bar Linkage
13. Spring Release Solenoid
14. Cam Follower Rollers (Main Toggle Roll)
15. Radius Arm
16. Close Latch Check Switch
18. Trip Latch
20. Latch Roller
22. Spring Discharge Roller Free Height Adjustment
23. Spring Discharge Close Latch Yoke End Adjustment
24. Spring Discharge Roller
25. Charge-Discharge Indicator
26. Discharge Indication Adjustment
27. Charge Indication Adjustment
28. Mechanical Charging Interlock Adjustment
29. Manual Charing Shaft (515-1 Operator)
30. Anti-Pumping Relay
33. Close Latch Bite Adjusting Screw
34. Close Latch Bite Adjusting Locking Nut
35. Motor Cutoff Switch Actuator
36. Lower Link Stop
38. Aluminum Spring Drive Blocks

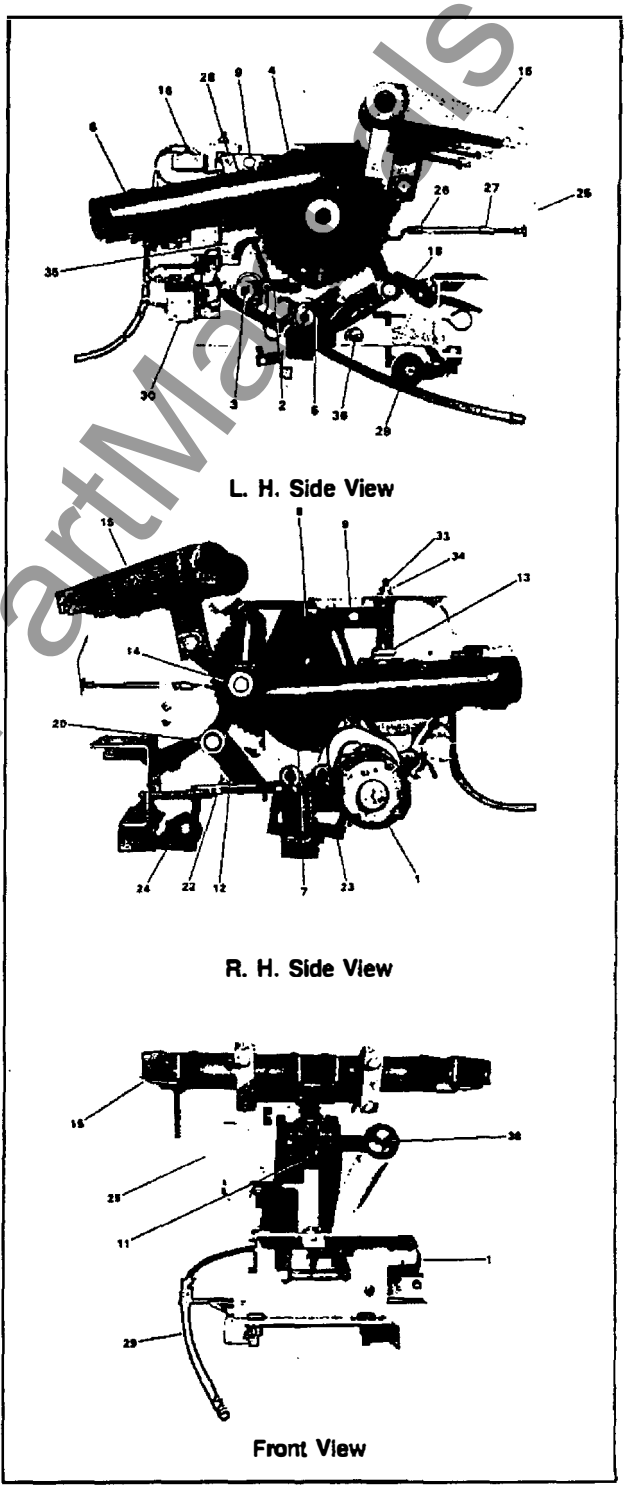


Figure 3. 515-1 Stored Energy Operator

Electrical Control

The normal control for this operator is contained upon a control panel mounted at the rear of the unit. It consists of the motor cutoff switch anti-pumping relay and the close latch check switch. The typical control arrangements elementary diagram is shown in Fig. 4 (Check schematics furnished with switch-gear as wiring arrangements vary.)

Spring Charging

The spring charging motor power is supplied through terminals 3 and 4, Fig. 4. The mechanical interlock is a switch operated by the breaker release lever (foot lever) which opens the motor circuit when the lever is depressed. The close latch check switch is closed when the close latch is in the reset position. The 88 switches are shown with the closing springs discharged. When the control is energized, the motor starts to charge the springs. The 88 switch is operated by a roll pin, striker mounted in the ratchet wheel. As the ratchet wheel and drive blocks charge the springs, the ratchet wheel revolves to the position of full compression dead center. Beyond dead center position, the springs aid rotation and cause the motor cutoff switch striker to depress the actuator of the 88-1 switch, opening the motor circuit and the 88-3 contact in the anti-pumping relay circuit. At this instant, the spring charging motor coasts to a stop with the driving pawl oscillating freely on the smooth portion of the ratchet wheel.

Closing Circuit

A typical control circuit for a stored energy operator is shown in Fig. 9. When the close control switch is closed, the circuit from terminal 7 through 88-2 and 52Y1 to 52B through trip latch timer, (when furnished), to terminal 6 energizes the closing coil, closing the breaker. As soon as the closing springs are discharged, the 88-3 switch contact closes to energize the 52Y relay. If the close control switch remains closed, the 52Y relay remains picked up through contact 52Y2. Control switch has to be released to reset control for another closing operation. This forms the anti-pumping relay circuit which prevents the circuit breaker from reclosing immediately after a trip free operation. If control power is momentarily lost during closing, upon re-energization, the 52Y relay picks up instantaneously through contact 88-3 maintaining the anti-pumping relay circuit prior to complete spring charging.

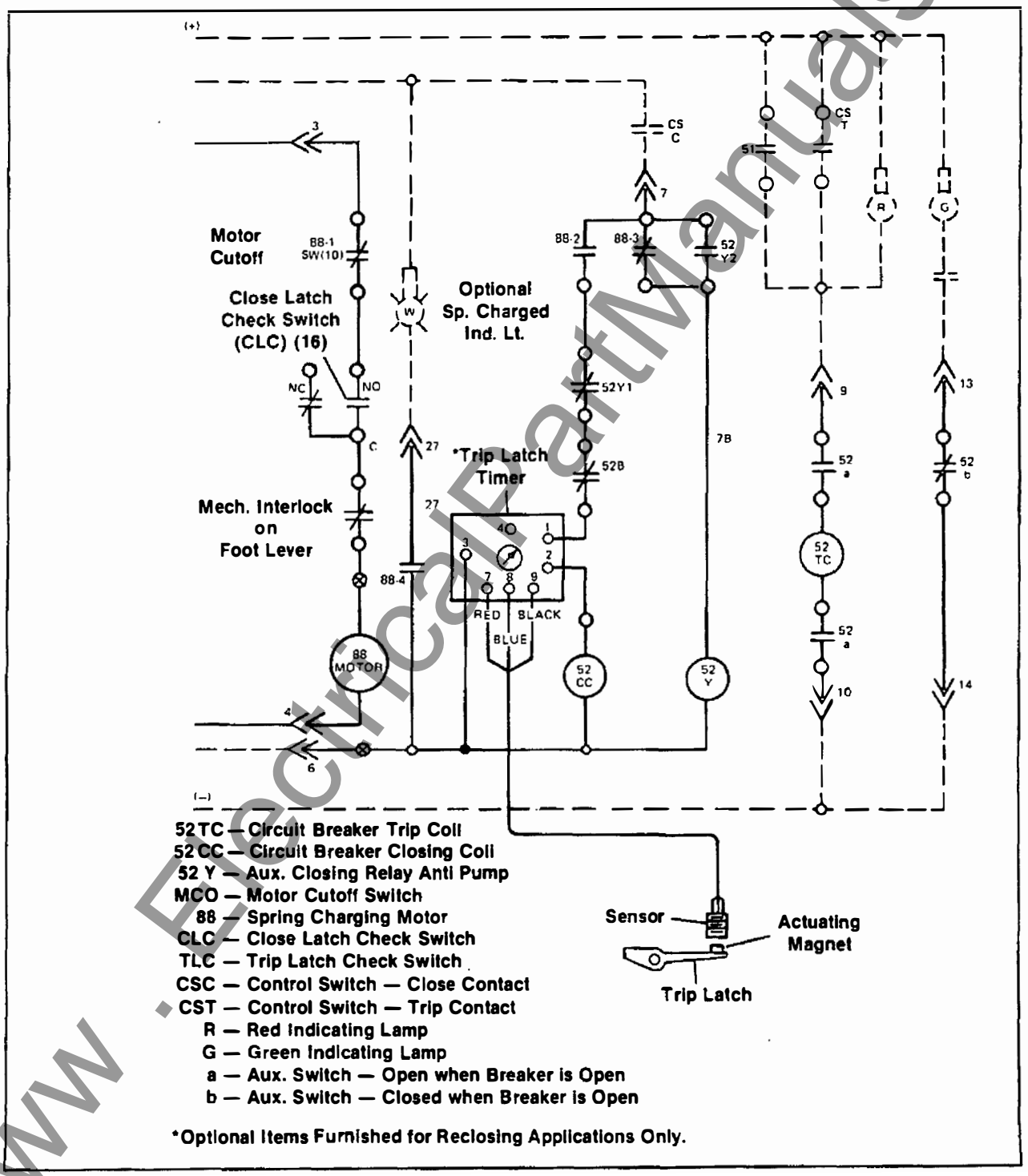


Figure 4. Typical Control for Stored Energy Operator

Reclosing Control (Optional — For Reclosing Applications Only)

The trip latch check system provides the necessary control to perform the reclosing function when the switch gear is equipped with reclosing relays.

The system is comprised of three elements; a magnetic actuator, a non-contacting magnetically operated Hall effect switch (sensor) and a timer module. The system performs two distinct functions prior to enabling the reclosing operation.

1. It senses that the trip latch has returned to its reset position, and is ready to receive a reclosing operation.
2. Imposes a delay following latch reset to insure the linkage assembly has fully reset and then applies power to the spring release coil.

The non-contacting magnetically operated Hall effect switch and magnetic actuator combine to perform proximity detection of the trip latch tail. The speed of operation and lift expectancy of this proximity sensor system is not limited by mechanical actuation as no physical contact between the actuating magnet and Hall switch exist. The switch consists of a Hall sensor, trigger, and amplifier integrated on a silicon chip. Its complete encapsulation isolates the device from environmental affects.

Capacitor Trip Device

A capacitor trip device is commonly used with circuit breakers having an ac control supply installed in remote locations of unattended substations where battery cost and maintenance are undesirable.

In these cases, the capacitor trip device may be charged from the same stepdown transformer that is used to energize the breaker control. This stepdown transformer should be connected to the line side of the breaker.

To apply the capacitor trip device to existing breakers originally shipped with dc trip coils, contact your Siemens sales representative.

Trip Solenoid

Normal electrical tripping (opening) is caused by the trip solenoid which is designated 52TC on the schematic of Fig. 4. The trip solenoid is energized by operation of the circuit breaker control switch and the protective relays which are mounted on the switchgear.

Auxiliary Equipment

Auxiliary Switch

Mounted on the breaker, the auxiliary switch is normally used to open the trip circuit when the circuit breaker is opened. As this multi-stage switch operates from the breaker disconnect blades, circuitry dependent on the position of the breaker, such as indicator lights, etc., is wired through this switch. The individual stages are easily converted to "a" or "b" without disassembling the switch (Fig. 5).

The type Q-10 auxiliary switch has been tested and adjusted at the factory. Contracts used in the breaker control circuit should not require further adjustment.

The switch (Fig. 5) is designed so that the individual contacts may be repositioned in fifteen degree steps without disassembling the switch.

Using long-nosed pliers, move the rotor contact (16) in the slot of the shell (14), compressing spring (15). This will free the rotor from the retainer (17). Rotate the rotor to the desired position and release. Be sure the rotor springs back solidly against the retainer to fully engage the rotor and retainer teeth.

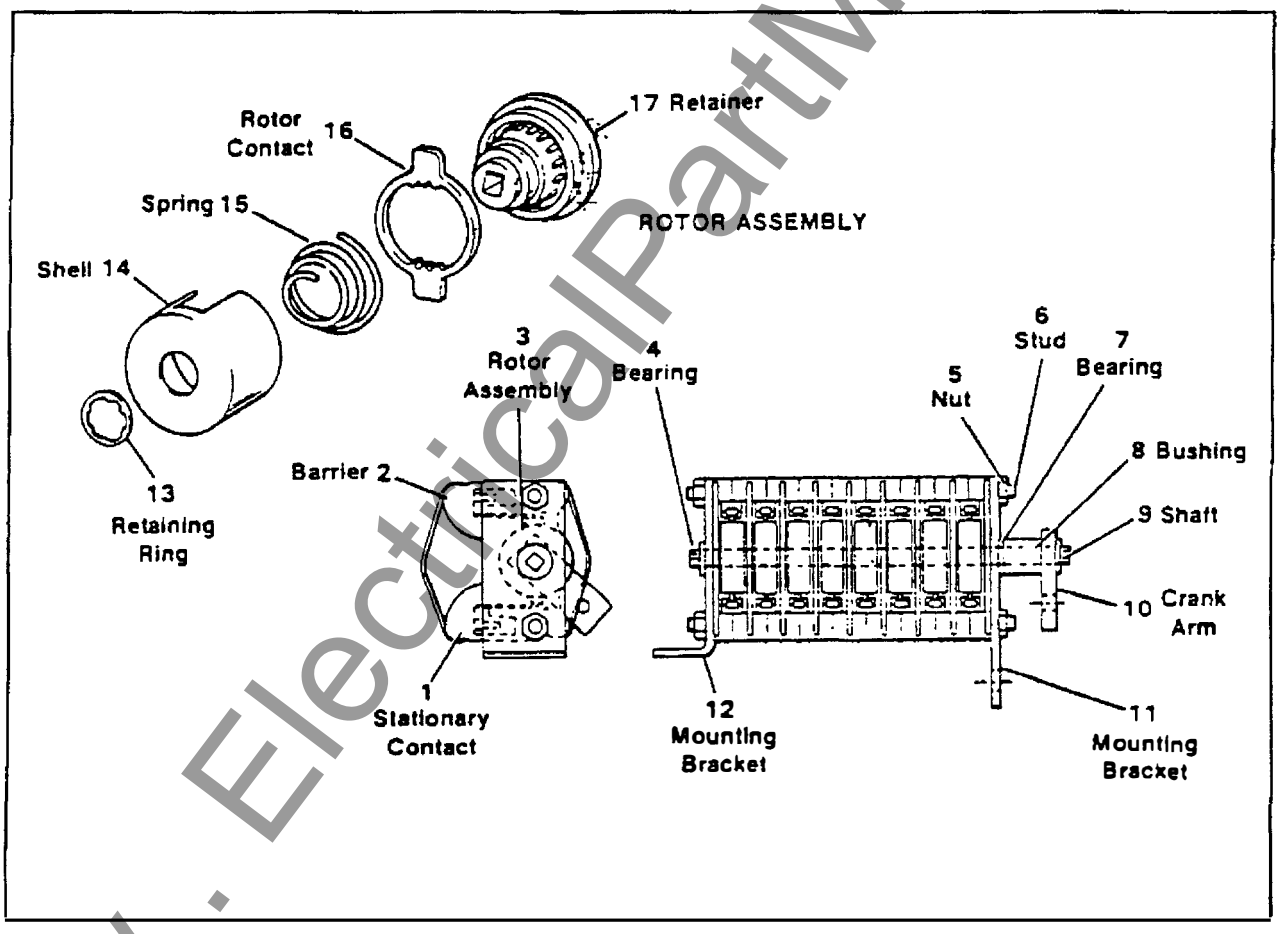
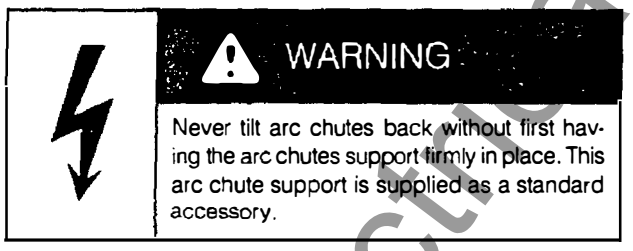


Figure 5. Type Q-10 Auxiliary Switch

Arc Chute Assembly

Each arc chute (Fig. 6) consists of a flame retardant envelope which provides phase isolation for interruption and venting of the by-product gasses of interruption. The arc chute contains —

1. The stationary end arc runner (4) and moving end arc runner (3) to which the arc terminals transfer from the arcing contacts. The arc runners form paths for the arc terminals to travel up the arc chute.
2. The stationary end blowout coil (15) and moving end blowout coil (13) which connect their respective arc runners to the top and bottom bushings. The current in these coils creates the magnetic flux which passes through cores (18), pole pieces (22) and the space between the pole pieces. The action of this flux on the arc forces the arc up the barrier stack.
3. The barrier stack (23) consisting of a number of refractory plates, with "V-shaped" slots, cemented together. The barrier stack cools, squeezes and stretches the arc to force a quick interruption.
4. The barrier (1) containing coolers (28) through which the by-product gases of interruption pass, completes the cooling and deionizing of the arc products.



⚠ WARNING

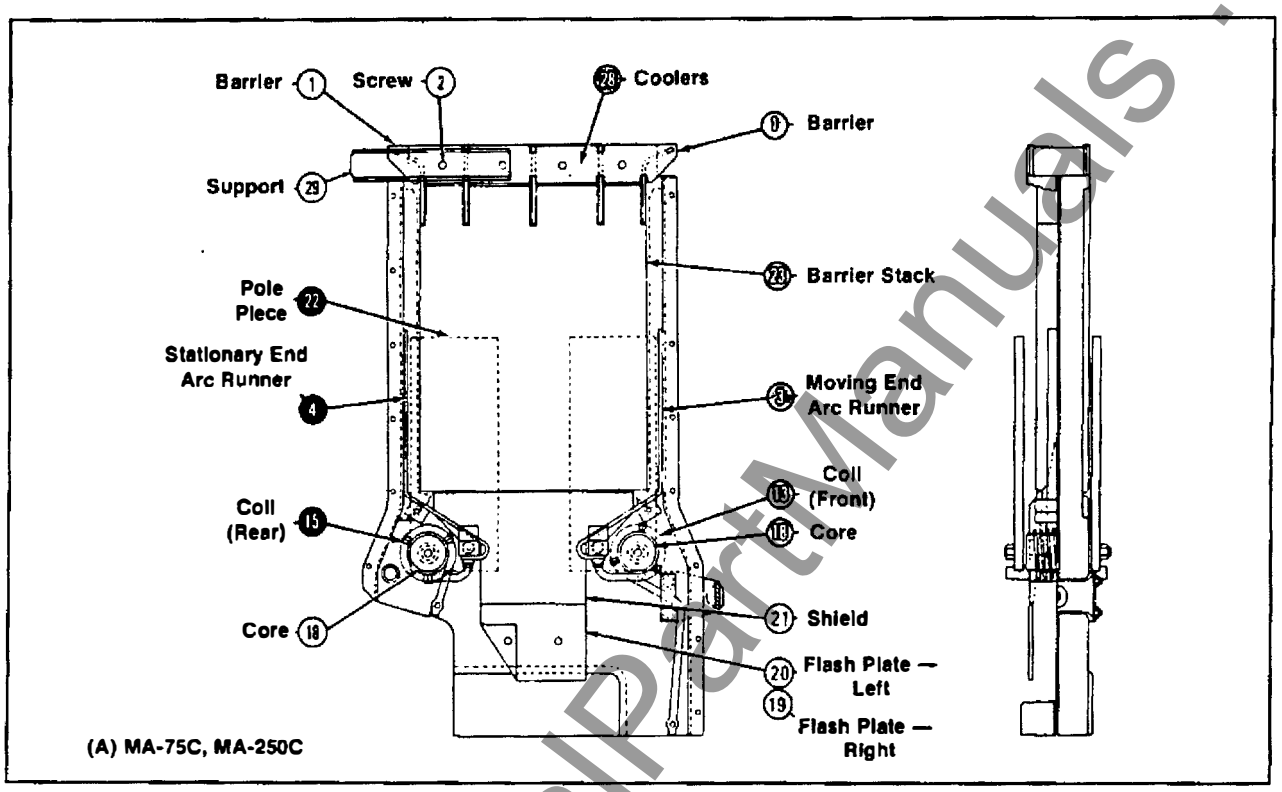
Never tilt arc chutes back without first having the arc chutes support firmly in place. This arc chute support is supplied as a standard accessory.

Arc chutes are tilted to expose contact area for inspection of barrier stack (23). The arc chutes may also be lifted and removed from the breaker. Unfasten front and rear coil connections before tilting or removing arc chutes.

Barrier Stacks

The barrier stacks (Fig. 6) are fragile and must be handled carefully. Inspect the barrier stacks for erosion of the plates in the areas of the slots. The barrier stacks should be replaced when a milky glaze appears on the full length of the edges of most of the slots. They should also be replaced if plates are broken or cracked. When cleaning the breaker and cubicle, inspect for pieces of barrier stack refractory material which would obviously indicate breakage.

To remove the barrier stacks, tilt back the arc chutes, remove screws (2) and barrier (1) from each arc chute. Slide barrier stack (23) through top of arc chute. When replacing barrier stack be sure the V-shaped slots go in first.



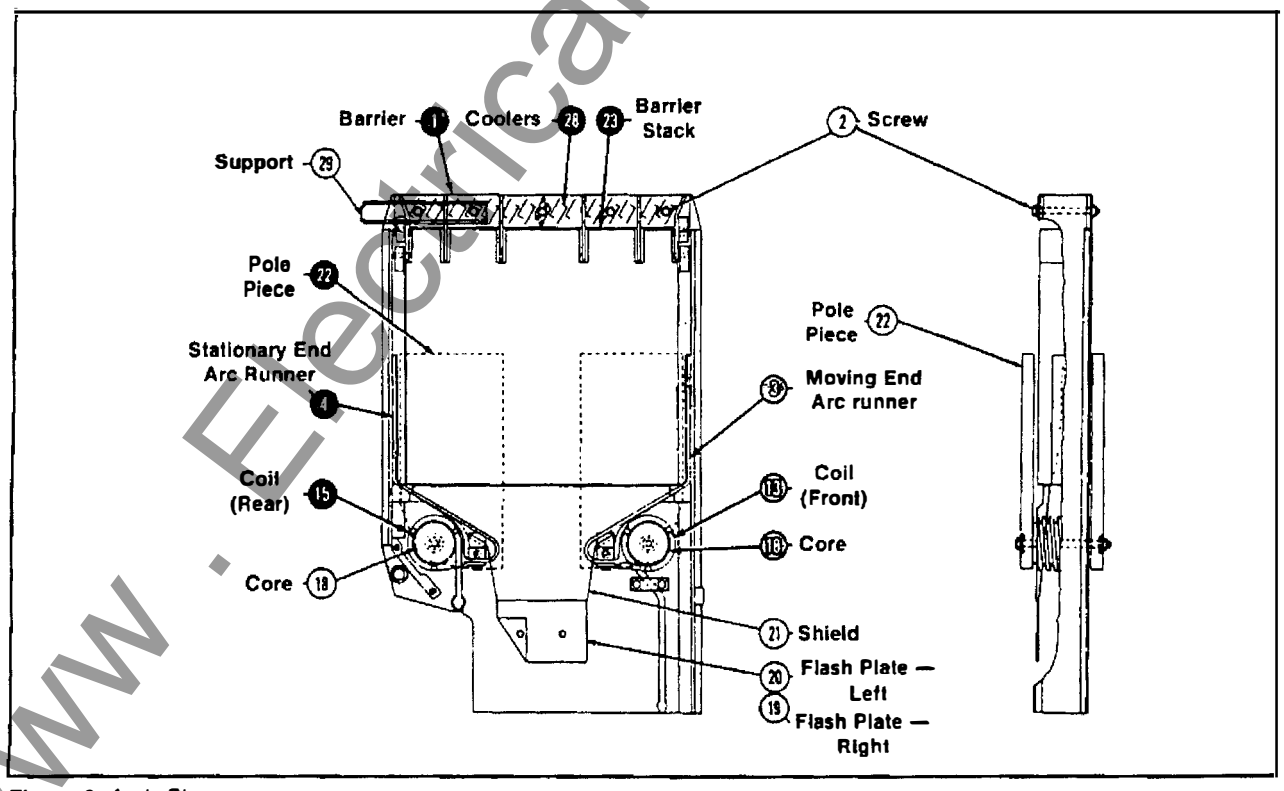


Figure 6. Arch Chutes

Close Latch — Mechanical and Electrical Interlocks

The close latch must be fully reset to receive the cam mounted spring release rollers at the end of the charging cycle. To insure the close latch is in this fully reset position, an electrical and mechanical interlock is provided.

The close latch check switch (16, Fig. 7) consists of a snap-action type switch mounted in close proximity to the close latch. A striker plate at the tail of the close latch engages the switch's actuator slightly before the fully reset position is achieved, and actuates the switch prior to the latch's reaching the fully reset position. At the time of actuation, a contact closes initiating the charging sequence. The switch operates with very small differential, and this sensitivity coupled with the close latch biased engagement of the spring release rollers provides a positive sensitive interlock.

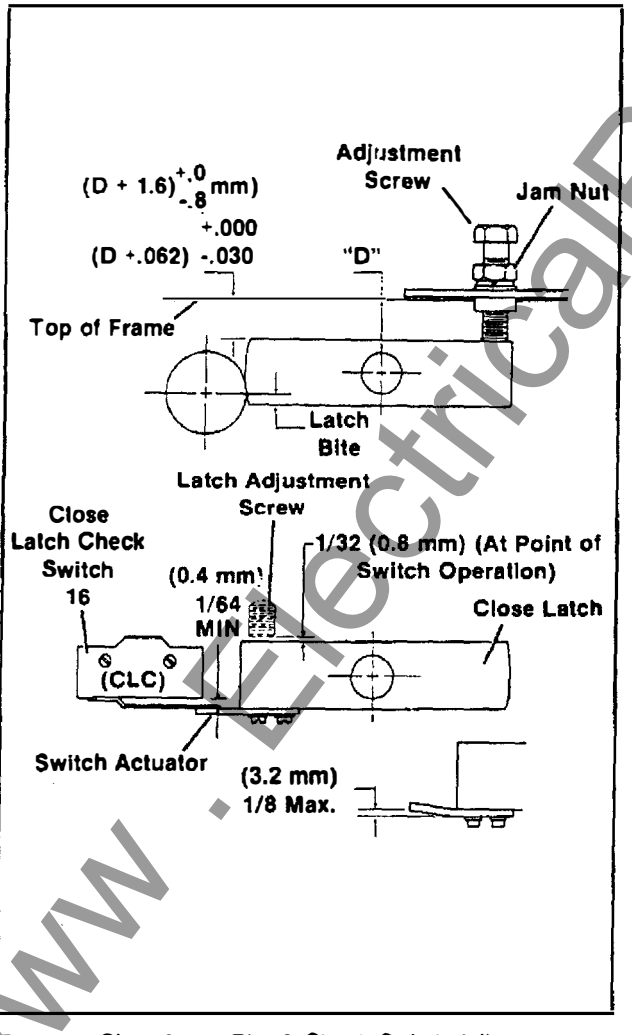


Figure 7. Close Latch Bite & Check Switch Adjustment

The mechanical interlock (Fig. 8) prevents manual charging of the breaker if the close latch is not adequately reset. A linkage attached by a clevis to the close latch extends down the side of the breaker frame to the driving pawl mechanism. An extension of the interlock's linkage passes above the driving pawl's constant force return spring. If the close latch fails to return to a fully reset position, the linkage extension thrusts the driving pawls return spring downward preventing the driving pawl's engagement of the ratchet wheel, thus mechanically inhibiting either manually or electrical spring charging.

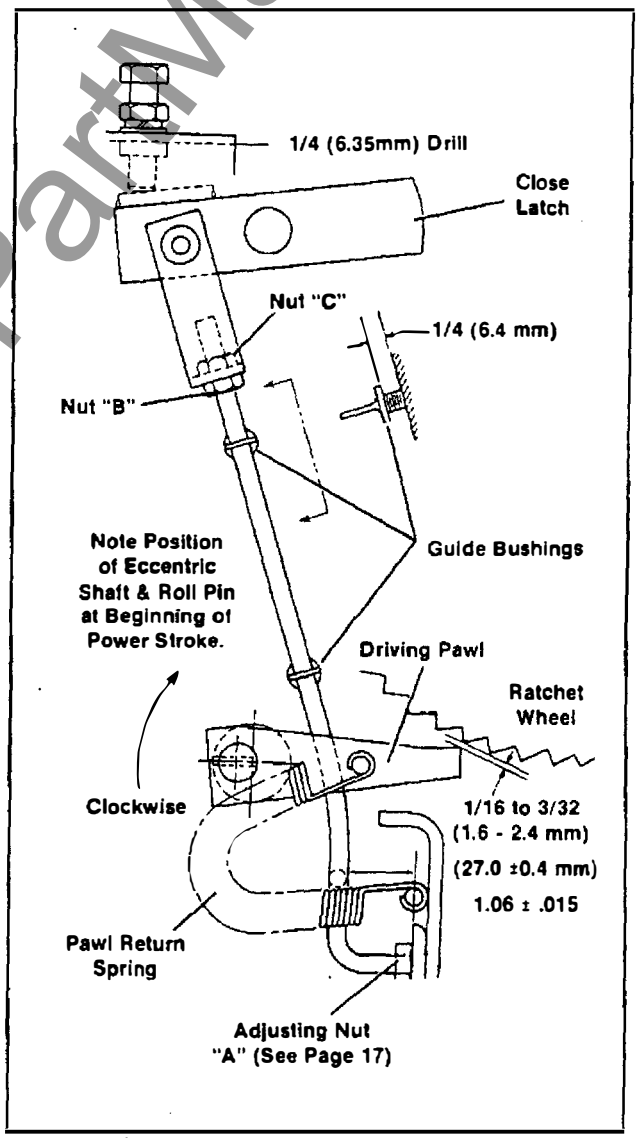


Figure 8. Close Latch Mechanical Interlock

Factory Adjustments

Adjustments are factory set and checked before and after numerous mechanical operations on every breaker to insure correctness. No adjustment checking should be necessary on new breakers. If a malfunction occurs, check for hidden shipping damage.

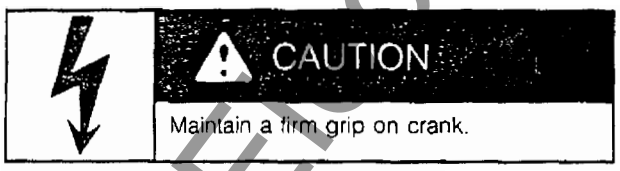
The following will help you make the correct adjustments when replacing a broken or worn part.

Circuit Breaker Timing

A comparison of circuit breaker timing at any period of maintenance with that taken when the breaker was new will indicate the operational condition of the breaker mechanism. A time variance of more than ½ cycle (8.3 ms) on opening and 2 cycles (33.3 ms) on closing indicates a maladjustment of friction buildup. A hole in the movable contact arm is provided for connection of a speed analyzer.

Manual Charging of Closing Springs

To charge the closing springs manually, disconnect control power before inserting the manual charging crank in the socket at the lower left-hand corner of the breaker. Turn the crank in counter-clockwise direction to charge the springs. Note: Never turn crank in clockwise direction as this can damage flexible shaft. The effort to charge the closing springs will fluctuate and will increase to a peak and then decrease. At the point of least effort an audible click will be heard and the effort to turn the crank will drop to near zero, continue to turn crank 3 or 4 more turns, the mechanism is now fully charged. The breaker may be closed by pulling the manual close pull rod.



The closing springs are charged through the driving pawl and ratchet wheel and are thereby indexed by the holding pawl. Some springback can occur between tooth positions on the ratchet wheel.

Interlock Plunger

The foot lever breaker release (20, Fig. 9) operates the interlock plunger (18, Fig. 9) as well as the trip latch. Depressing the lever trips the breaker and raises the plunger. This frees the breaker so that it can be moved in its cubicle. The interlock system is in proper adjustment when the plunger is positioned 1-11/16 to 1-13/16 inch (49.2-46.0 mm) above the floor line, and causes tripping of breaker contacts when it is raised to a level not more than 2-1/16 inch (52.4 mm) above the floor line. The latch tripping rod associated with the foot lever should be clear of the trip latch by 1/32 to 1/16 inch (0.8-1.6 mm) in the relaxed position.

The foot lever can be padlocked by matching holes in the breaker frame with those in the lever arm. In the padlocked position, the foot lever will be halfway down; the breaker will be trip-free; the interlock plunger will be between 2 and 2-1/4 inches (50.8-57.2 mm) from the floor line and will hold the breaker in any of the three positions within the cubicle.

Phase Barrier Assembly

Full size barriers of high dielectric flame retardant material isolate each phase (Fig. 10).

To remove phase barriers, lift panel spring assembly (13) out of slots (14) to release panel (32). Lift and remove Panel (32). Remove screws (23 and 93) from barrier (22).

Remove screws (2, 48 and 49). Remove rear barrier (25).

Tilting Arc Chutes

⚠ WARNING

Never tilt arc chutes back without first having the arc chute support firmly in place. This arc chute support is supplied as a standard accessory. See Fig. 9.

Remove phase barriers as described under "Phase Barriers," above. Refer to Fig. 10. Remove Allen Head Capscrew (51—not illustrated) and screw (37) on each phase to disconnect blowout coils.

Position arc chute support at the rear of the breaker (Fig. 9) and tilt back the arc chutes.

After arc chutes are tilted back to their normal position, make sure all screws have been replaced and tightened securely on all phases before phase barriers are replaced.

NOTE

Make sure that blowout coils have been reconnected.

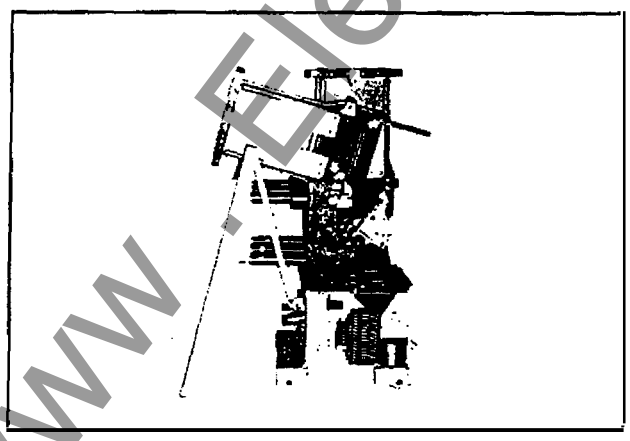
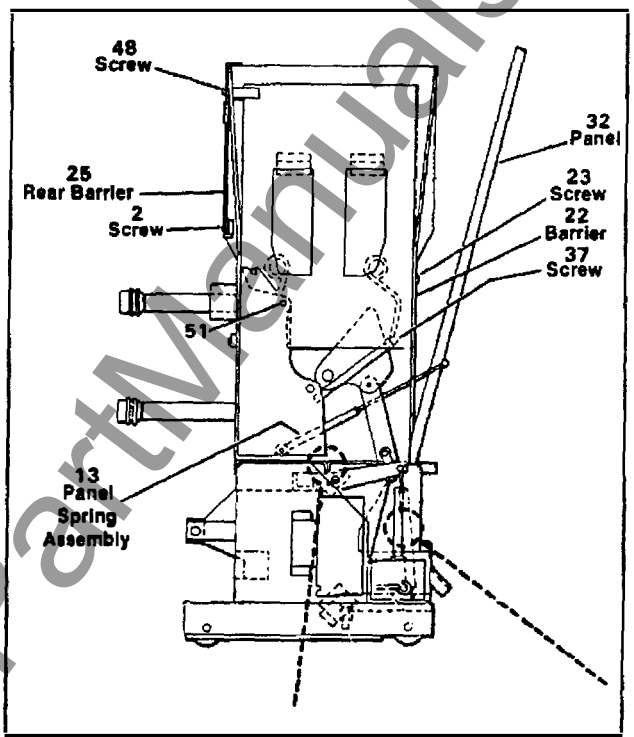


Figure 9. Arc Chute Support



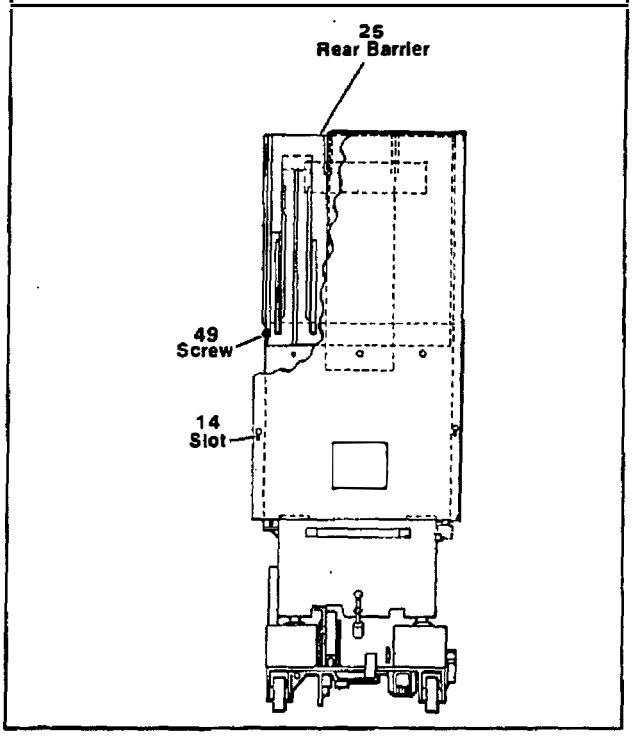


Figure 10. Circuit Breaker Assembly

Trip Latch Adjustments

Trip Latch Clearance Adjustment (Fig. 11) — This adjustment is to be performed after completing the arcing contact touch and main contact penetration adjustments referenced above.

This adjustment is necessary to insure proper clearance between the trip latch and trip latch rollers. The puffer (or snubber) height adjustment will accomplish this purpose, and in no way will affect the penetration adjustment.

Loosen Lower Link Stop and rotate to permit maximum Lower Trip Link movement. Adjust puffer (or snubber) height to rotate radius arm and four bar linkage until a .030 to .060 (0.76-1.52 mm) gap appears between the trip latch and latch roller. Lock in place. Rotate Lower Link Stop until it touches lower link and lock in place. Recheck dimension "d" as described in procedure D, page 17.

Trip Latch Bite Adjustment — Trip latch bite is established by setting the latch tail top surface 5/16 (7.9 mm) below surface of self-clinching nut as shown in Fig. 12A. Lock securely with jam nut. One turn of adjusting screw will alter the gap 0.062 inches (1.57 mm). This adjustment should produce 0.259 to 0.111 inches (6.58-2.82 mm) of latch bite as shown in Fig. 12C.

⚠ DANGER

This can only be measured while springs are fully charged.

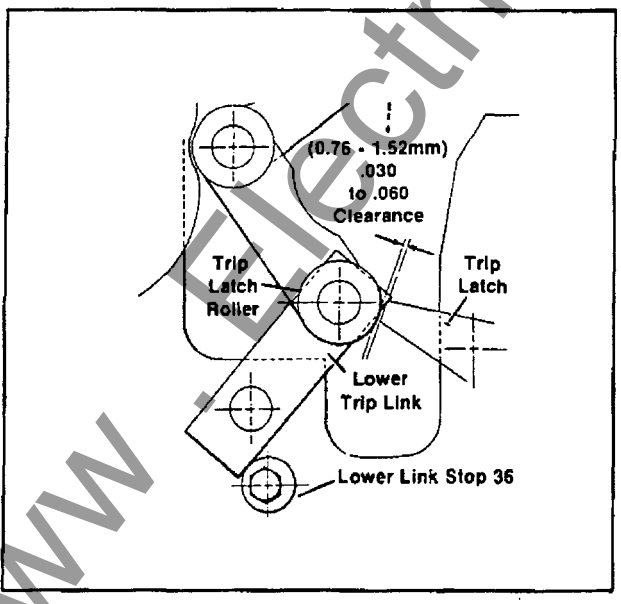


Figure 11. Trip Latch Clearance Adjustment

Trip Latch Check Sensor Adjustments

(See Fig. 12)

The magnetically operated Hall effect switch (sensor) and actuating magnet are preassembled to the operator. The unit can be adjusted by advancing the threaded bushing through the tapped hole in shelf until a gap of .040-.000 + .015 (1.02-.00/ + .38 mm) is achieved between the surface of the switch and the top of the shrink tubing holding the magnet actuator assembly to the trip latch. With this gap achieved, the sensor may be locked in place.

Functional electrical test on breaker may be made to confirm sensor's operation. The timing module's nameplate and rated voltage should be checked to insure it matches breaker closing control voltage. The timer's delay adjustment has been previously set and should not be altered. Remove wire from terminal 2 on timer module and insulate. Open breaker and charge opening springs.

Apply closing voltage and observe light emitting diode (led) adjacent to delay adjustment. The led should be brightly illuminated when the trip latch is fully reset. Depress latch with manual trip lever and observe the led goes out. Release trip lever and the led should come on. This sequence confirms sensor operation. Do not apply closing control voltage for longer than two minutes while performing this test.

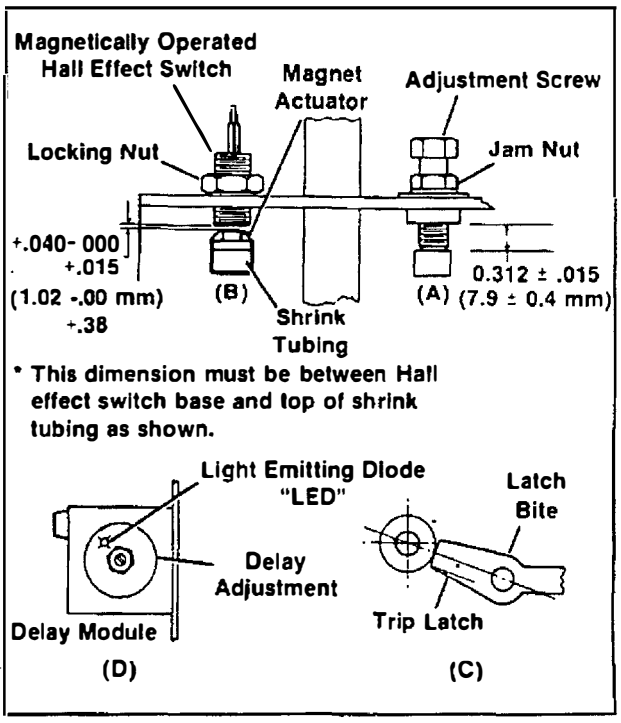


Figure 12. Trip Latch Bite and Check Switch

Contact Alignment And Replacement

The main and arcing contacts are an integral part of the bushing assemblies and are carefully aligned with the upper and lower bushings before shipment. Normally, no further adjustment is necessary.

Use these procedures if it becomes necessary to change contacts or reset contact alignment (refer to Fig. 13).

Procedure A. Horizontal Alignment

1. Push stationary contact fingers (item 11, Fig. 13) as far back as they will go on stud.
2. Using maintenance closing procedure, move the disconnect towards the closing position until it touches a main contact finger (view A-A), Main Contacts Engaging, Fig. 10). Dimensions "C" should be no greater than .020 (0.51 mm) with one contact touching.
3. Adjustment is made by loosening two nuts (22) and rotating the entire contact assembly. Check alignment (dimension "C") after nuts (22) are tightened.
4. Alignment is checked and adjusted on each phase separately. Be sure there are no binds between contacts (11) that could prevent wiping action with the disconnect arm.

Procedure B. Contact Penetration (Stroke)

1. Contact penetration should be checked and adjusted only when the contacts are properly aligned.
2. Check that open gap "d" is approximately correct to avoid penetration (see Procedure D).
3. Using power closing procedure, close and latch breaker. The spread of the contacts (view "A-A", Breaker Latched) should be 1/8 to 3/16 inch (3.2-4.8 mm). This is the total of the two gap dimensions "a" measured on each side of the contact centering tube between the brass tube an the flat stop surface on the contact. Each "a" dimension is normally 1/16 to 3/32 inch (1.6-2.4 mm).
4. With the breaker open, adjust by increasing or decreasing length of link (8) by turning nut (16). Adjust each phase separately.

Procedure C. Arcing Contact Lead

Arcing contacts are adjusted only after the main contacts have the proper alignment and penetration. The arcing contacts should mate before the main contacts. To measure and adjust each phase:

1. Push stationary main contacts back on stud.
2. Using the maintenance closing procedure, slowly move the disconnect arms toward the close position until a dimension of 1/4" ± 1/32 (6.4 ± 0.8 mm) can be measured between the lower stationary main fingers and the disconnect arms of the closest phase. (See Fig. 10 dim. b view A-A arcing contact engaging). The moving disconnect arm should be pushed back when making the measurement.
3. With the disconnect arm in proper position established in step 2, adjust nut (1) to have the moving arcing contact touch the stationary arcing contacts. (Push the moving arcing contact back when setting).
4. Advance maintenance closing to obtain proper individual positions of the other phase disconnect arms in accordance with step 2 and set arcing contact lead in accordance with step 3. (Simultaneous touching of arcing contacts on all three phases is not required. Do not impair penetration of arcing contact lead setting in an attempt to optimize.)

Procedure D. "Breaker Open Position"

Dimension "d" (Breaker Open illustration of Fig. 13) is measured between the disconnect arm and the bottom of the second finger from the top in the main contact assembly. The open position is determined by the setting of the rod end at the top of the puffer piston rod. The rod end (if set too low) can affect the trip latch roller clearance. The optimum setting is to obtain the maximum open contact gap "d" while maintaining the specified trip latch roller clearance (see strip latch adjustment page 17). A dimension "d" of less than 3-11/16 in. (93.7 mm) indicates improper adjustment.

Contact Pressure of Disconnect Arm Hinge Joint

The hinge joint contact pressure is in proper adjustment when a pull of 4 to 6 pounds (1.8-2.7 kg) is required to move the disconnect toward the open position.

This measurement is obtained as follows: (Fig. 13)

Remove pin (12) and detach link (8) from the disconnect arms (18) and (19). Move the disconnect to a position just short of contact. Attach a spring scale to the disconnect 8 1/2 inches (216 mm) above screw (24), and in a direction perpendicular to the longest edge of the disconnect arm. Measure the pull to move the disconnect toward the open position after start of motion. Read scale while disconnect is moving through normal opening.

Adjustment is made by tightening (or loosening) nut (14).

Before attaching link (8) to disconnect arms (18 and 10), check contact alignment and contact lead (Page 18).

Arcing Contact Hinge Joint

The arcing contact hinge joint (Fig. 13) is in proper adjustment when each spring washer (15) is deflected approximately 0.015 inches (0.4 mm).

This adjustment is obtained by tightening nut (4) until all parts just touch, then tighten the nut 3/4 to 1 turn more.

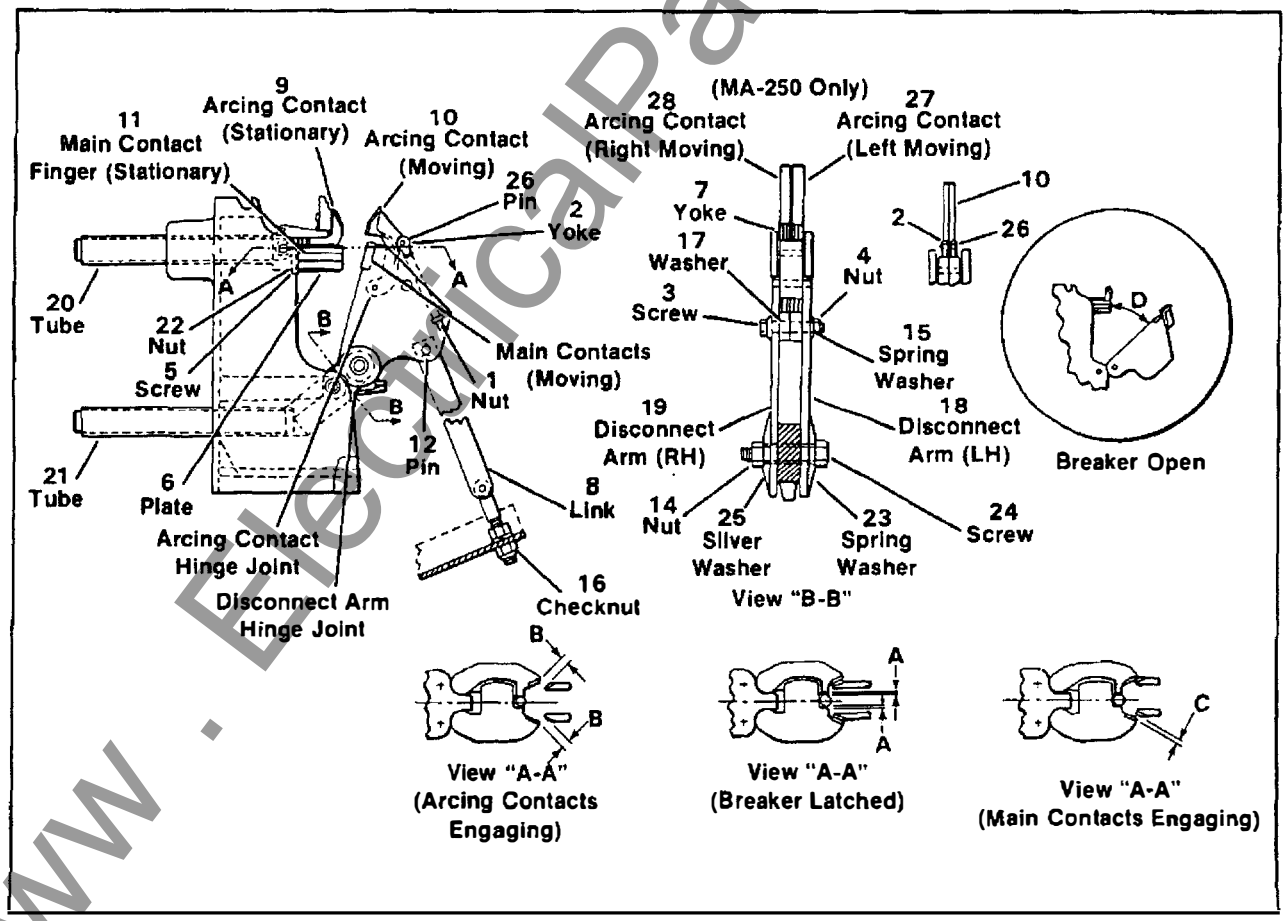


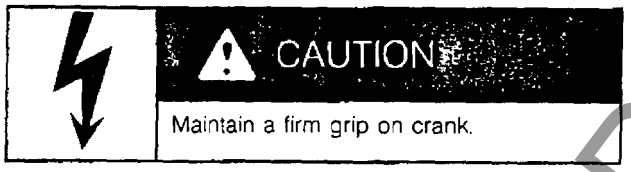
Figure 13. Stud and Support Assembly

Maintenance Slow Close

With the breaker removed from the cubicle, manually charge the closing springs as previously described and remove charging crank. Then, from the rear or stud side of the breaker, attach the spring blocking device. Fig. 14, by fastening it in the slots in the closing spring tubes.

Stay clear of the breaker contacts and pull the manual close pull rod at the front of the breaker. This will discharge the closing springs against the spring blocking device during which the breaker contacts will move slightly toward the closed position.

Place the spring charging crank back in the socket at the lower left corner of the breaker. By turning the crank counter-clockwise the breaker contacts may be slowly closed for checking contact alignment.



As the contacts will close in increments predicated by the teeth on the ratchet wheel, springback will occur between teeth positions.

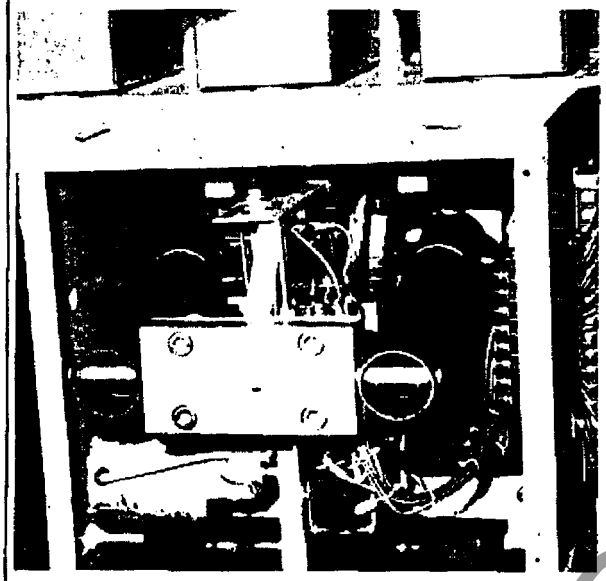
Removal of Spring Blocking Device

To remove the closing spring blocking device, Fig. 14, the closing springs must be fully charged. The springs may be charged manually by inserting the charging crank and continuing counter-clockwise rotation. The main contact will go fully closed as the four bar linkage toggles. Upon continued rotation, the closing springs will be picked up as noted by increased effort in cranking. Continue rotation until the springs are fully charged. A sharp click wil be heard as the spring release rollers engage the spring release latch indicating full spring charge has been achieved. The spring blocking device may not be easily removed pulling the blocking portion from the slots in the spring tubes.

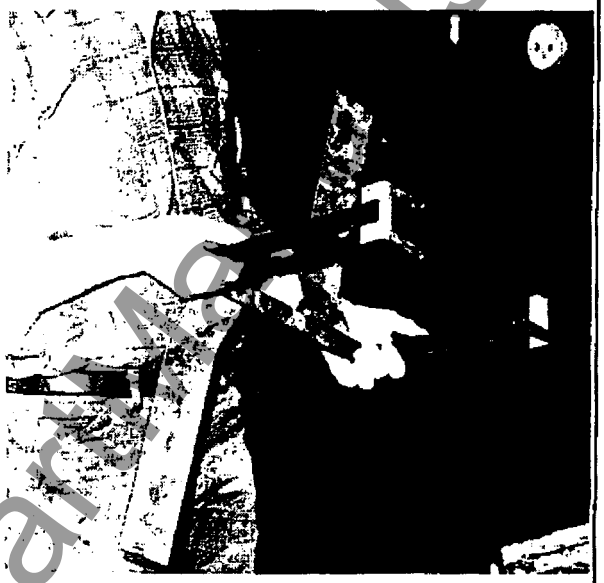
Removal of Closing Springs (Springs Must Be Discharged)

The Closing Springs may be quickly and safely removed from the breaker. Remove two of the four bolts holding the spring bearing block at the rear of the breaker. These bolts should be diagonally opposite each other. Insert studs approximately 6" (150 mm) long in place of bolts. Remove the remaining two bolts by shifting the spring load to the 6" (150 mm) long studs. The spring bearing block can then be backed off by alternating backing off the studs. To install the closing springs the reverse procedure should be used. The spring bearing block top surface should be even with the bracket of the frame. The four bolts should be torqued to 50 ft. lbs. (67.8 N.m.)

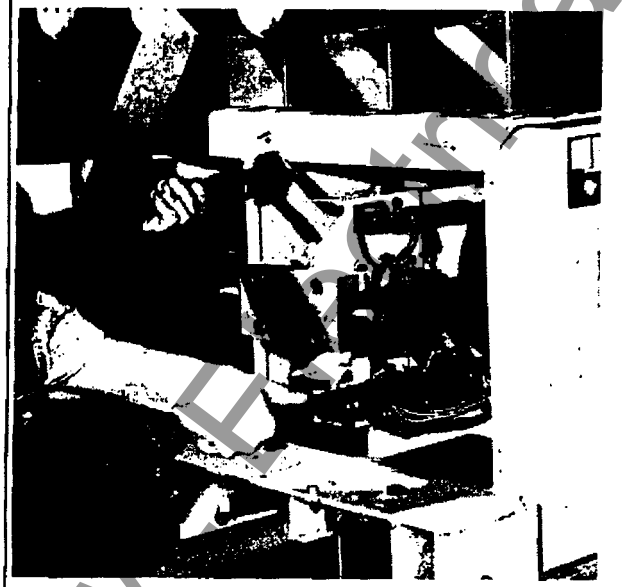
If the charging ratchet and cams are to be revolved with springs removed, it is advisable to remove two aluminum spring drive blocks (item 38 Fig. 8) secured to the ratchet and cam crankpins by retaining rings. These pins if not removed or held essentially in a horizontal position may jam while revolving the cam and ratchet assembly.



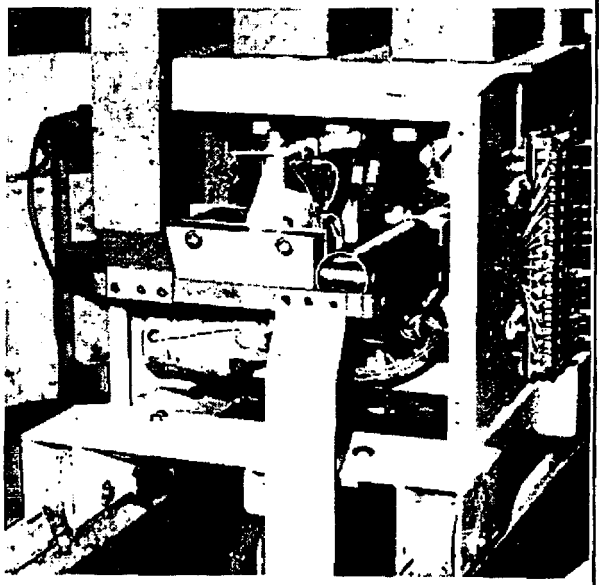
Breaker Charged and Ready to Receive Spring Blocking Device



Spring Blocking Device in Correct Position for Insertion



Insertion of the Spring Blocking Device. NOTE: Spring Blocking Device Must Be Diagonally Inserted to Clear Breaker Frame.



Spring Blocking Device in Place Ready for Closing Spring Release

Figure 14. Maintenance Close Spring Blocking Device Insertion

Motor Cutoff Switch

Motor Cutoff Switch — The 88 motor cutoff switch assembly (Fig. 15) is factory adjusted. If it should become inoperative, entire unit must be removed and inspected for contact wear. Replacement may be necessary.

Motor Cutopff Switch Adjustment — This adjustment is most conveniently performed before installing the charging springs.

Advance ratchet and *can* assemblies to position shown (Fig. 15). The holding pawl must rest behind the ninth (9) tooth position on the ratchet as counted counterclockwise from "area" on ratchet periphery which lacks two teeth.

With ratchet in the position described above, adjust the motor cutoff switch vertically until its actuator makes positive contact with the "rollpin striker." Lock switch assembly in this position.

Check lateral movement of actuator. Lateral play at end of actuator (tip) should be no more than 1/16" (1.6 mm) max. If adjustment is necessary, snug pivot screw to just bind actuator, and then back off 1/16 to 1/8 turn. Rotate ratchet and cam assembly to insure actuator rides in gap between ratchet and cam without striking or binding.

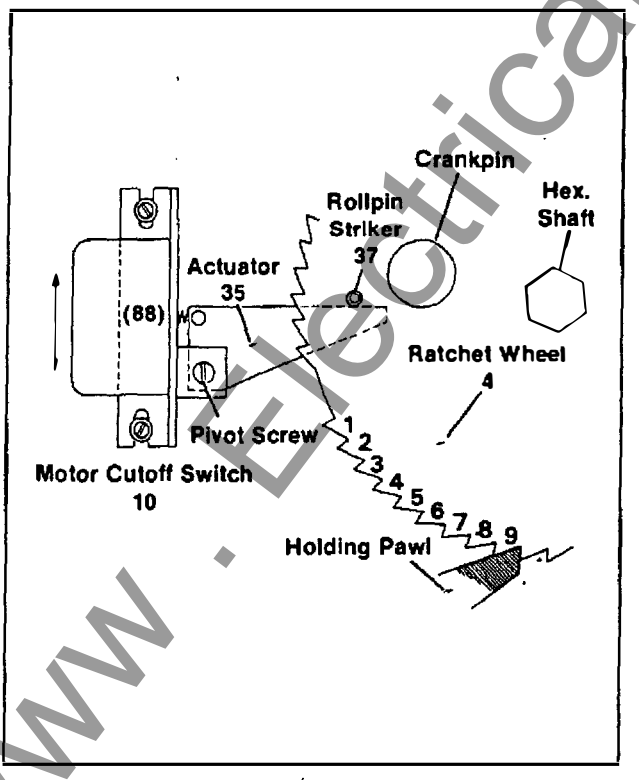


Figure 15. Motor Cutoff Switch

Close Latch

Close Latch Bite Adjustment — Free jam nut and place latch in horizontal position (Fig. 16). Visual accuracy. measure "D" directly above latch pivot. Reproduce this dimension plus 0.062" (1.6 mm) at the latch face as shown in the figure above by rotating the adjustment screw. Secure jam nut. This adjustment should produce a latch bite of 0.151 to 0.216 inches (3.8-5.5 mm).

Close Latch Check Switch Adjustment (Fig. 16) — This adjustment is to be performed only after completing the latch bite adjustment described above.

A clearly audible "click" should be heard from the switch with latch spaced 1/32" (0.8 mm) from latch adjustment screw. The latch switch actuator may be bent slightly to obtain switch operation at this point. Maximum permissible bend is 1/8" (3.2 mm) as shown.

If switch actuator is bent, observe latch fully closed against adjusting screw and make certain the switch actuator has not contacted the switch body. A 1/64" (0.4 mm) clearance should exist as shown in Fig. 16.

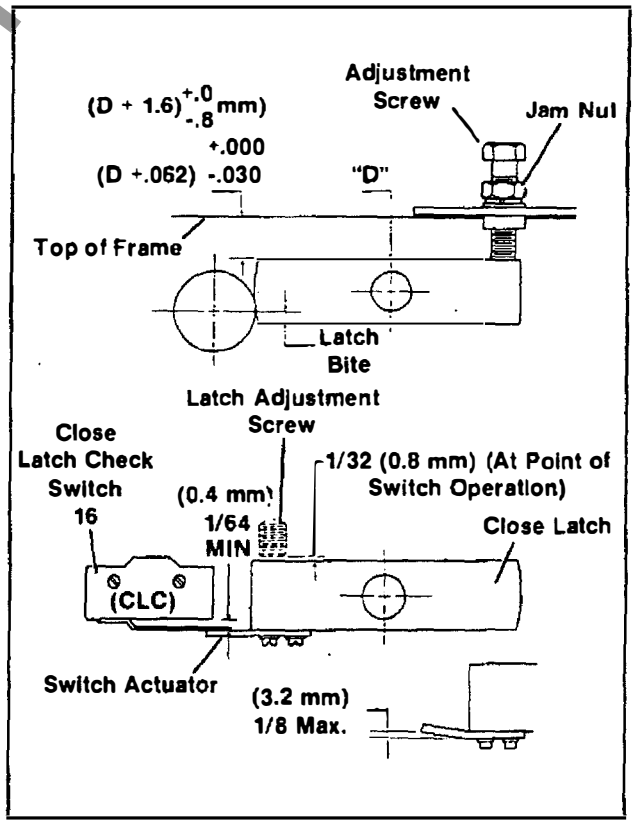


Figure 16. Close Latch Bite and Check Switch Adjustment

Free Height Adjustment

Free Height Adjustment (Fig. 17) — is achieved by blocking the actuating roller to the indicated height and adjusting a pair of jam nuts, located on the manual closing pull rod, to maintain the roller in this position with blocking removed. Return spring adjusting nut should be set to produce (.5 ± .06 inch (12.7 ± 1.6 mm) deflection in return spring.

The following adjustments are to be made only after completing the close latch bite adjustment described on the previous page and after adjusting connecting link as shown on Fig. 17.

Trip Adjustment

Trip Adjustment (Fig. 17) is made by varying the penetration of the "curved actuating rod" in its attachment clevis. A 5/16" (7.94 mm) drill is placed between the upper latch surface and the latch adjusting bolt. A 2.906" (73.81 mm) block is to be inserted between the actuating roller and floor. The "curved" rod's upper yoke is nested against a forward roll pin in the closing latch and the lower clevis is adjusted to insure the closing latch will not move more than 1/16 (1.6 mm) inches are measured between adjustment screw and latch surface when the 5/16" (7.94) drill moved.

Over Travel

Overtravel (Fig. 17) — No adjustment required. Check with 3.125" (79.4 mm) blocking below actuating roller. Closing solenoid link should provide freedom of latch movement without jamming.

This adjustment is to be performed only after completing the close latch bite adjustment.

The purpose of this adjustment is to establish an armature gap of 3/16 to 1/4 inches (4.8-6.4 mm). A suitable feeler gauge of optimum thickness .218" (5.56 mm) should be inserted in the armature gap. That is the space between the ground surfaces of the solenoid frame and ground "T" shaped extensions of the solenoid plunger.

The connecting link between the solenoid plunger and close latch should be adjusted to maintain the plunger in this position. The locking screw is released and the adjusting cap shifted until the effective length of the link supports the plunger within the indicated range.

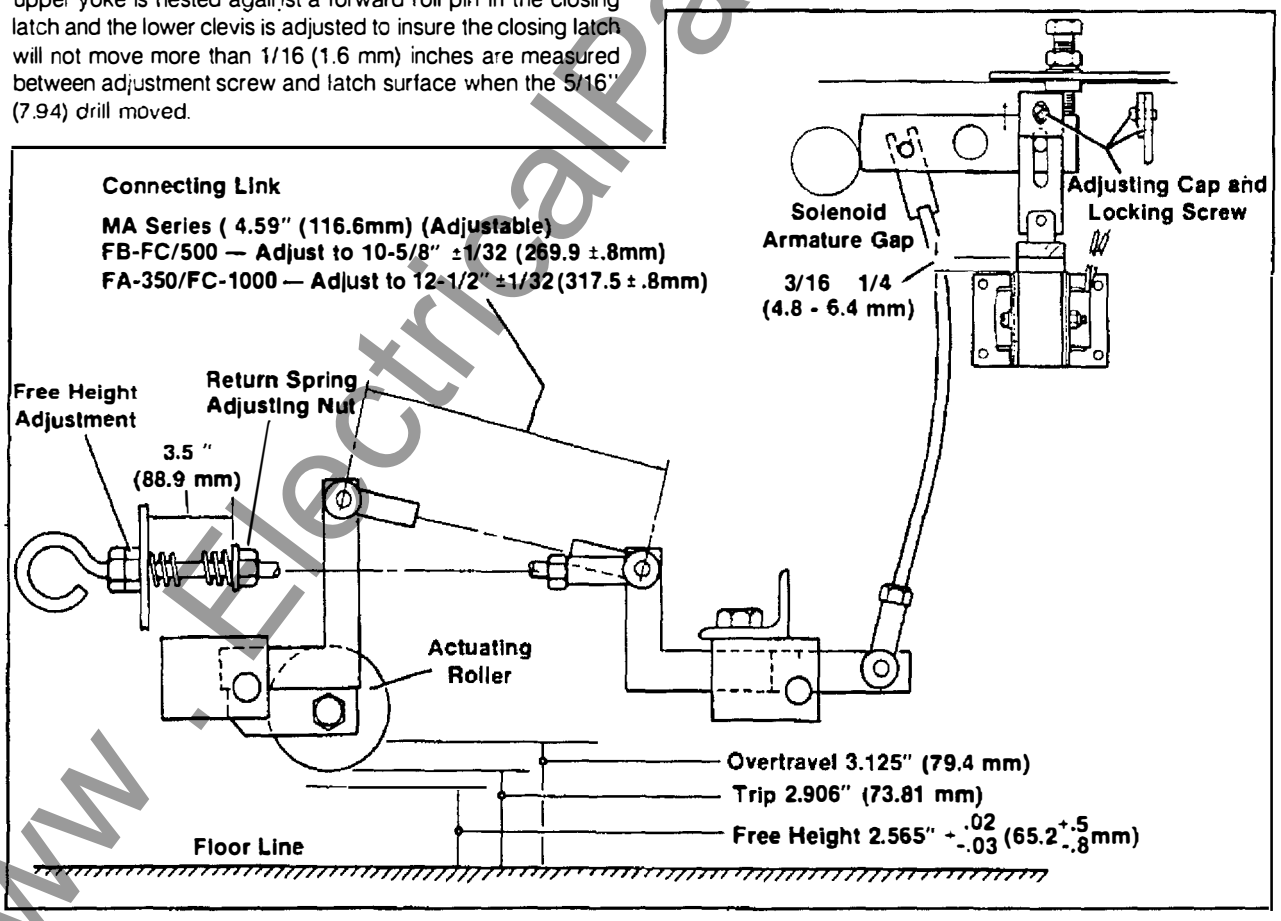


Figure 17. Closing Spring Discharge Mechanism

Close Latch Mechanical Interlock

Close Latch Mechanical Interlock — This adjustment is to be undertaken only after completing the close latch bite adjustment described on page 22.

Adjust actuator rod displacement from support angle to 1.06 ± 0.15 inches (27.0 ± 0.4 mm). See detail of adjusting nut "A" (Fig. 18).

Insert a 1/4" (6.35 mm) drill between upper surface of close latch and latch adjustment screw.

Check guide bushings to insure they stand off the frame 1/4" (6.4 mm) as shown.

Free Nut "B" below attachment clevis, and adjust Nuts "B" and "C" to depress pawl return spring and pawl until 1/16 to 3/32" (1.6 mm-2.4 mm) clearance is obtained between tip of pawl and ratchet teeth. This clearance is measured during the clockwise rotation of the pawl as its tip is toward the rachet (power stroke).

The pawl must be rotated using 1/2" (12.7 mm) square insert in the eccentric drive shaft or by low voltage (slow rotation) of drive motor or manual charging.

Return the jam nut "C" attachment clevis to bottom on bracket, and tighten external jam nut "B" securely. **Maintain Clevis Parallel To Frame.**

Remove 1/4" (6.35 mm) drill, restoring latch to its normal position. Again rotate eccentric drive shaft. The tip of the drive pawl should engage the full face of each ratchet tooth with a clearance of .030" (0.8 mm) between the base of the tooth and the engaged tip of the drive pawl.

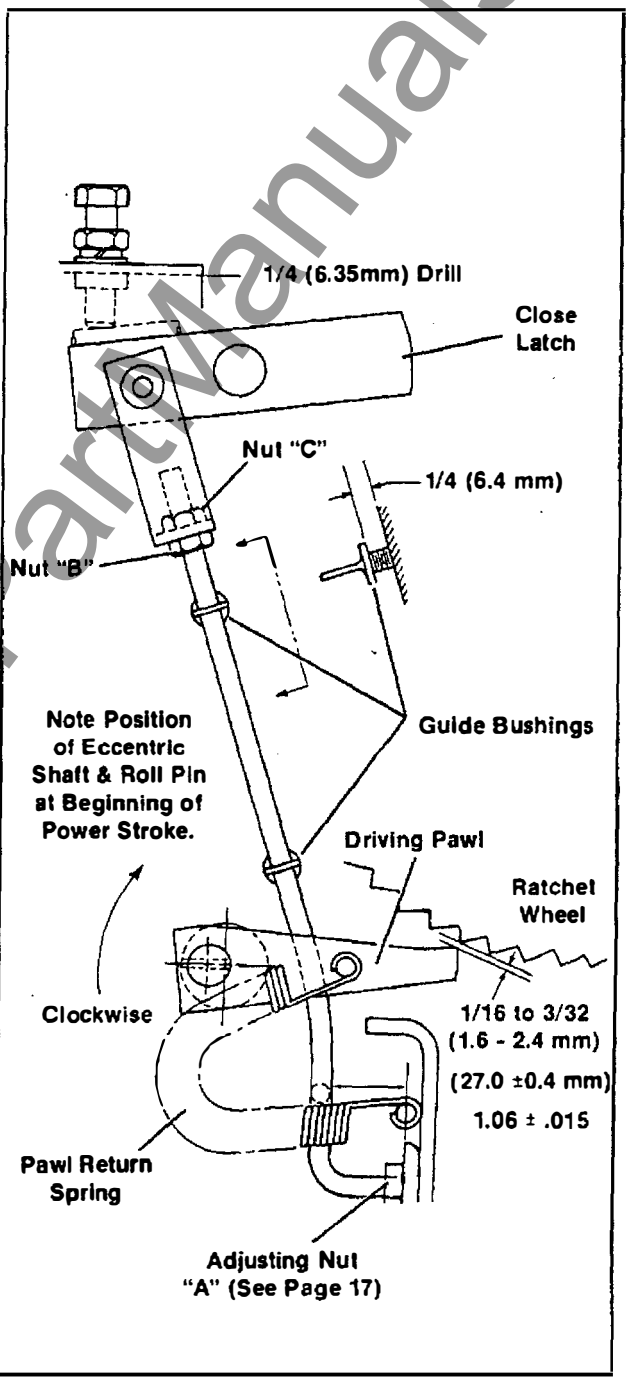


Figure 18. Close Latch Mechanical Interlock

⚠ DANGER

Do not work on energized equipment. Unauthorized personnel should not be permitted near energized equipment. Plan the time for maintenance with operating personnel so that the switchgear can be de-energized, and safely grounded.

General

Thorough, periodic inspection is important to satisfactory operation. Inspection and maintenance frequency depends on installation, site, weather and atmospheric conditions, experience of operating personnel and special operation requirements. Because of this, a well-planned and effective maintenance program depends largely on experience and practice.

Always Inspect A Breaker Which Has Interrupted Heavy Fault Current. All contacts, arc runners and arc chutes should be examined to determine if repair or replacement of parts is required. Inspect for pieces of barrier stack refractory material in the cubicle as well as the circuit breaker.

"As Found" Tests

Some users perform "As Found" insulation tests using a megger or Doble testing to give an "As Found" value for future comparative indication of insulation change. This is desirable for new circuit breakers if they are to be sorted for extended periods, and may absorb moisture and contaminates. Contact resistance tests can also be made using a ductor.

Since wide variations can occur in insulation values and contact resistance because of atmospheric conditions, contaimination and test equipment, discrete values cannot be given. However, making and recording these tests on new equipment, and at regular intervals will give a comparative indication of insulation and/or contact resistance change. Maintaining a permanent record of these values for each circuit breaker should be a part of the Maintenance Program.

Periodic Inspection And Maintenance

Prior to performing any maintenance work, make certain all control circuits are open, and that the breaker has been completely withdrawn from the metal-clad unit.

⚠ CAUTION

Do not work on the breaker or operating mechanism while the breaker is in the closed position. Do not work on the breaker or operator while the closing springs are charged.

1. Remove interphase barriers (refer to page 15, Phase Barrier Assembly) and clean them and all other insulating surfces with dry compressed air — a vacuum cleaner, or clean lint free rags. Inspect for signs of corona, tracking or thermal damage.
2. Tilt the arc chutes to expose the main contacts. **Refer to page 16 before tilting Arc Chutes.**
3. Contacts

   Examine the contacts, Fig. 13. The major junction of the air circuit breaker depends upon correct operation of its contacts. These circuit breakers have two distinct sets of contacts on each pole, main and arcing. When closed, practically the entire load current passes through the main contacts.

If the resistance of these contacts becomes high they will overheat. Increased contact resistance can be caused by pitted contact surfaces, corrosion of contact surfaces, or weakened contact spring pressure. This will cause excessive current to be diverted through the arcing contacts, with consequent overheating and burning. Verify proper main contact pressure by checking penetration (refer to page 18 Procedure B).

Arcing contacts are the last to open, and arcing originates on them. In circuit interruption, they carry current only momentarily, but that current may be equal to the interrupting rating of the breaker. In closing against a short circuit, they are the first to close and may momentarily carry considerably more than the short circuit interrupting rating. Therefore, they must make contact prior to the main contacts. If not, the main contacts can be badly burned.

On the magnetic blow-out air circuit breaker, the arc is quickly removed from the arcing contacts by magnetic forces and transferred to arc runners in the arc chute (Fig. 6). The arcing contacts are expendable and may eventually burn enough to require replacement.

The main and arcing contacts are made of tungsten alloy to resist deterioration due to arcing. If the surfaces are only roughened or slightly pitted, they can be smoothed with crocus cloth or

draw filled. Be careful not to remove much material, as this would shorten the contact life. If significant erosion has occurred, the arcing contact lead must be checked and adjusted using Procedure C on page 18.

If they are badly pitted or burned, they should be replaced. (Refer to page 18.)

The main contacts may be lubricated per Fig. 19, but **Do Not Lubricate The Arcing Contacts.**

4. Disconnect Arm Hinge Joint

   Check contact pressure of the disconnect arm hinge joint per page 16. If the pull is within the 4 to 6 pound (1.8-2.7 kg) acceptable range, the joint should be satisfactory. If not, then it should be maintained as follows:

   Remove disconnect arms as a unit by removing screw, nut and spring washer. Carefully inspect all contact surfaces in hinge joint. Replace any damaged parts. Silver washer and adjacent surfaces should be clean and free of roughness or galling. However, discoloration of the silvered surfaces is not usually harmful unless caused by sulfide (insulating) deposits. These should be removed with alcohol or a silver cleaner. Lubricate silver washer and mating surfaces by applying electrical contact lubricant (Fig. 19). Reassemble hinge joint. Tighten screw and nut. Spring washer and silver washer must be assembled in their original position to assure proper adjustment. Adjust per page 19. Contact Pressure of Disconnect Arm Hinge Joint and Arcing Contact Hinge Joint.

5. Arc Chutes

   Inspect the arc chutes. This includes inspection of the ceramic parts (barrier stack and flash plates) for breakage, erosion and dirt; inspection of the blowout coil insulation; and of the entire arc chute for dirt, moisture or contaminates which might affect insulation strength.

   Dirt or contaminates may be removed from the barrier stack with a cloth, by light sanding or by scraping with the end of a file. Wire brushing or emery cloth is not approved because metallic particles may become embedded in the insulating material.

   Arc flash plates in the lower portion of the arc chute may be cleaned by sand blasting or by sanding with coarse grain paper, to remove glaze and metal deposits from the surface.

   Blow out particles with dry compressed air.

   Small cracks or pieces shippped or broker from ceramic parts may be ignored. A barrier stack split vertically along a rope seam may be repaired with epoxy cement. A barrier stack split horizontally or one with several broken plates should be replaced.

   The action of the arc on ceramic causes slight melting. Small milky glass nodules on the edges and surfaces of the ceramic barrier stack plates are normal after interruption. With severity and number of operations, this melting and glazing increases. When barriers are heavily glazed (milky white along the edges of the V slots) the barrier stacks should be replaced.

   Blowout coil and core insulation should be inspected for evidence of abrasion, heating or mechanical stress which could lead to electrical discharge between coil and core.

   Mechanically damaged, burned or punctured blowout coils and core insulation should be repaired or replaced.

6. Mechanism — Stored Energy Operator

   The circuit breaker mechanism should be inspected at 2000 operation intervals (1000 operation intervals for the MA-350 breaker). This inspection should check for loose hardware and any broken parts. The control wiring should be checked for loose connections and frayed or damaged insulation. The "close latch check switch," "trip latch check system" (if furnished), and the "mechanical interlock" switch should be assured with a continuity meter and manual manipulation of the switching element, and adjust if necessary. Verify that operation of "Close Latch Mechanical Interlock" is proper (refer to page 14 and Fig. 8).

   After 10,000 operations, (5000 operations for the MA-350), the operating mechanism should be given a general overhaul and all worn parts replaced. Excessive wear will usually be indicated when adjustments can no longer be satisfactorily made. The general overhaul will require disassembly of the operating mechanism. All bearings and surfaces receiving wear should be examined carefully and re-lubricated in accordance with lubrication instruction which follow.

   The removal of the closing springs will be necessary in order to permit overhaul of the breaker. These springs may be removed as described on page 20.

7. Lubrication

NOTE

The lubricant supplied with the accessories is intended to be used exclusively on the contacts and must not be used on any part of the circuit breaker mechanism.

Recommended circuit breaker lubrication points are shown in Fig. 20. The chart (Fig. 19) outlines two methods of lubrication. Refer to this chart for recommended lubricant and points of application. The first method requires no disassembly and is suggested for the prevention of problems which could be created by severe environmental or operating conditions. The second method follows procedures similar to those performed on the breaker at the factory. Follow this procedure only in case of a general overhaul or disassembly.

Needle and roller bearings are factory lubricated for life and should not require attention. However, the best of greases are affected by time and atmospheric conditions and may require service.

To lubricate these bearings when parts are disassembled, the following procedure is recommended. Clean in solvent, wash in alcohol, spin in light machine oil, drain and repack with Beacon P-325 grease. DO NOT REMOVE NEEDLE BEARINGS FROM THE RETAINING PART.

8. Air Puffers

   Air puffers (E, Fig. 20) are important to the interruption process because they provide a flow of air which assists in controlling the shape of the arc column at low curent values. This control causes the arc to make an earlier transfer to the arc runners, thereby energizing the magnetic circuit which drives the arc into the barrier stack. This action produces a shorter arcing time than would be possible by relying only on the thermal effects of the arc to achieve the transfer to the arc runners.

   Puffers should be inspected during the regular breaker maintenance periods. Hoses should be checked for flexibility, freedom from kinking or collapse and soundness of connection to mating parts. Also make sure that Ty-rap is in place and tight. Cylinders should be checked for cleanliness and freedom from deposits which might retard the motion of the piston. Pistons should be checked for free movement within the cylinder and that the seats are flexible and contact the walls of the cylinder. Transformer oil is used on felt seals to keep the materials pliable, reduce shrinkage and to provide lubrication. The oil should moisten but not saturate the felt.

   Replace seal material if it becomes inflexible or does not make contact with the cylinder walls.

   The air output from the puffer nozzle may be checked with the arc chutes tilted (refer to "Tilting Arc Chutes" page 16). Crush a 4½ x 4½ inch (115 x 115 mm) sheet of tissue paper, place it in the nozzle opening and check to see that it is dislodged when the breaker is opened.

9. Inspect for foreign objects which may have been left in the circuit breaker during previous steps. Check for loose hardware.

10. Check for mechanical freedom of disconnect arm movements by slowly closing the breaker. Reference page 20 for "Maintenance Slow Close" Procedure.

11. Trip breaker by depressing trip rod.

12. Return arc chutes to upright position, fasten both front and rear blowout coil connections and replace phase barriers. Be sure screws on all phases are tightened securely.

13. "As Left" Test
    a. Insulation resistance tests should be made to verify the insulation integrity. These can include megger or Dobel tests. If possible, a high-potential test should be made for one minutes at 14,300 volts ac or 20,200 volts dc. With the breaker open, check each phase across the open contacts by connecting from the upper to the lower primary disconnects. With the circuit breaker closed, check phase-to-phase and each phase-to-ground.
    b. A dielectric test on secondary and control circuits should b made at 1200 volts.
    c. If desirble, contact resistance tests can be made using a Ductor.
    d. Make a permanent record of all tests performed.
    e. Compare with prior tests (See "As Found" Tests on page 25).

14. Inspect the primary disconnect contact finger assemblies.

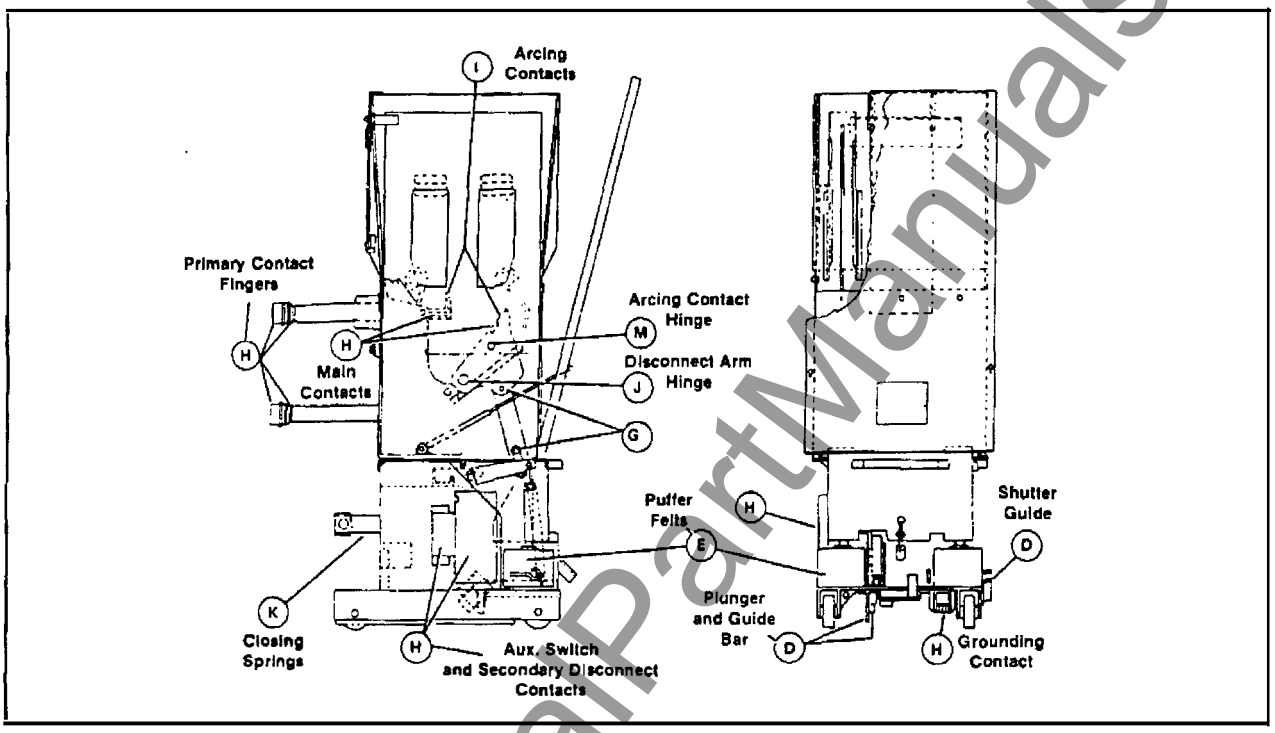
    The main contact surfaces should be clean and bright. However, discoloration of the silvered surfaces is not usually harmful unless caused by sulfide (insulating) deposits. These should be removed with alcohol or a silver cleaner. Slight impressions on the contacts will be caused by the pressure and wiping action of the contacts. Minor burns or pitting can be allowed and projecting burrs may be removed by dressing. Nothing more abrasive than crocus cloth should be used on the silvered contact surfaces. Where serious overheating is indicated by discoloration of metal and surrounding insulation, the contacts and spring assemblies should be replaced. In this case, also investigate the cubicle mounted stationary disconnects (with the switchgear de-energized) determine the cause of overheating, and take corrective action.

15. Prepare the circuit breaker for service by repeating steps 9 through 22 on page 4.

Lubrication Key	Part Description	Suggested Lubrication at Every *2000 Operations or Once Every Year	Alternate Lubrication (Requires Disassembly) Recommended After Every **10,000 Operations
A	Ground surfaces such as latches, rollers, props, etc.	Wipe clean and spray with *Molycote 557* 15-171-270-001.	Wash clean and spray with *Molycote 557* 15-171-270-001.
B	Nylon sleeve bearings	No lurication required.	No lubrication required.
C	Sleeve bearings and pivot pins, rotating parts, slide and pivot pins.	Light application of *Molycote Penelube* 15-171-270-002	Remove pins or bearings, clean per instructions and apply *Beacon P-290* 00-337-131-001.
D	Sliding surfaces	Light application of *Molycote 557*.	Wipe clean and apply *Molycote 557* liberally.
E	Air puffer cylinders.	Wipe clean and apply transformer oil #3 to felt.	Wash clean and wet felt ring in transformer oil #3.
F	Roller and needle bearings.	No lubrication required.	Clean per instructions and repack with *Beacon P-325*.
G	Dry pivot points.	No lubrication required.	No lubrication required.
H	Primary secondary disconnect fingers, arcing contact hinge, grounding contact and aux switch contacts.	Wipe clean and apply a film of Siemens contact lubricant 15-171-370-002.	
I	Arcing contacts.	Do no lubricate.	Do not lubricate.
J	Disconnect arm hinge joint, silver washer between bushing and the contact arm.	Wipe clean and apply a film of Siemens contact lubricant 15-171-370-002.	
K	Charging springs & spring retainers.	No lubrication required.	Wipe clean and coat with Beacon P-325
L	Manual charging bevel gear train FB & FC series only.	Remove snap on cover & coat teeth lightly with Beacon P-325.	Remove snap on cover & coat teeth lightly with Beacon P-325.
M	Arcing contact hinge assembly. Silver washers between bushing and contact arms.	Wipe clean and apply a film of Siemens contact lubricant 15-171-370-002	

*1000 for MA-350
**5000 for MA-350

Figure 19. Lubrication Chart



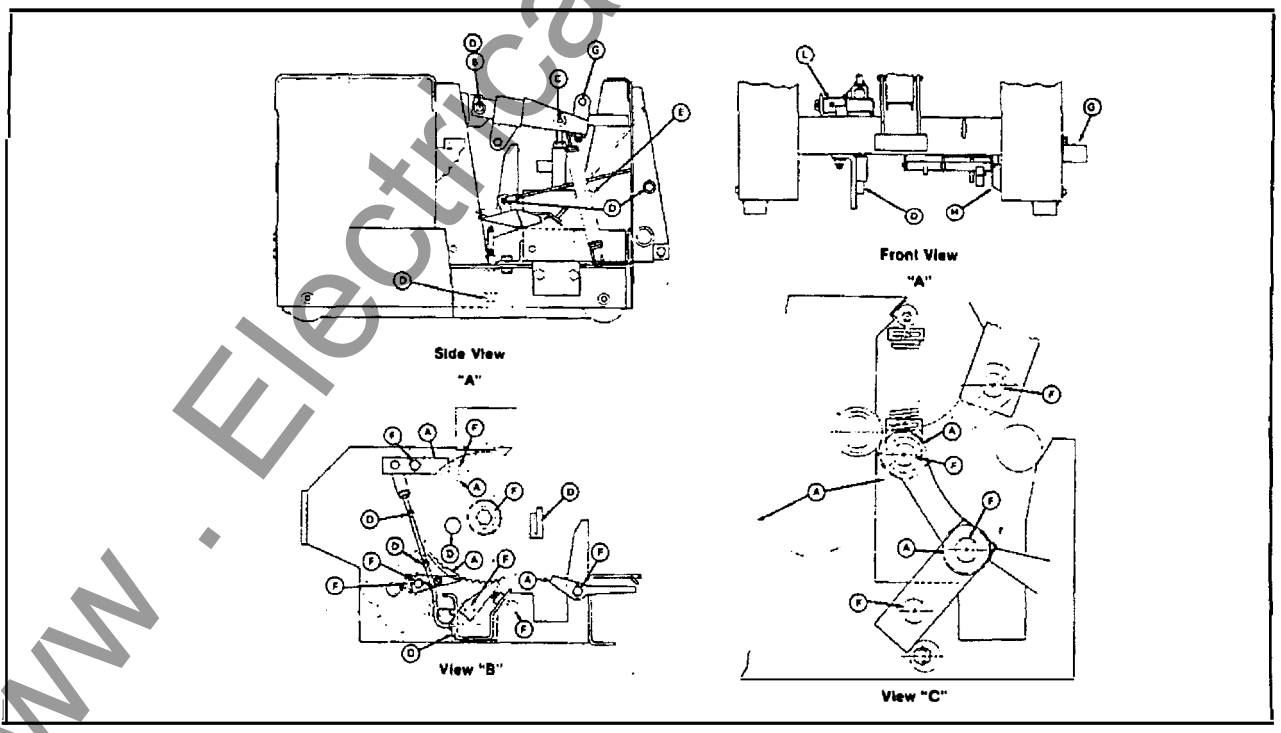


Figure 20. Lubrication points

EXHIBIT NO. 2

CHECKLIST FOR AIR CIRCUIT BREAKERS

Date Installed: _____ Date Serviced: _____ Job No.: _____

Taken From Cubicle #_____ Returned to Cubicle #_____

Type: _____ Rated Volts: _____ Rated Amp: _____ S/N: _____

Stored Energy: _____ Solenoid: _____ Manual: _____

FOLLOW APPROPRIATE INSTRUCTION BOOK

☐Arc Chutes
☐Primary Contacts
☐Auxilliary Contacts Checked
☐Sequence Checked
☐Manual Closure Operated
☐Manual Trip Operated
☐Breaker Cleaned
☐Hardware Tightened
☐Mechanical Interlocks Checked
☐Mechanism Operates Correctly
☐Puffer Operation Correct
☐Breaker Operated With Test Device
☐Alignment in Cubile Correct
☐Operated in Cubicle Test Position
☐AC ☐DC _____ Control Volts
☐Secondary Contacts
☐Main Contacts Alignment & Penetration
☐Checked Blow-Out Coil Connection
☐Trip Coil Operated
☐FC 1000 Only Blow-Out Coil Polarity Checked and Coil Connection
☐Interference of Breaker to Hinge Wire
☐Breaker Lubricated
☐Static Trip Unit Set
☐Static Trip Unit Tested
☐Limit Switches Checked
☐Open-Close, Disch., Indicators Checked
☐Breaker Put in Service
☐Counter Works Properly - Reading: _____
☐Ground Contact Checked

Environmental Conditions: _____

Megger: _____ DC Volt. Phase 1: _____ Phase 2: _____ Phase 3: _____
(When meggering a pole to ground, have the other two poles connected to ground. Megger each primary contract to frame ground.)

*☐Breaker Timed: _____ Cycles to Trip: _____ Cycles to Close

*☐Hi Pot Test: _____ Volts ☐AC ☐DC _____ MicroAMP.

*Hinge Joint Pressure: Phase 1: _____ Phase 2: _____ Phase 3: _____

*Contact Resistance: Phase 1: _____ Phase 2: _____ Phase 3: _____

*These tests to be performed only if specified.

REMARKS: _____

_____

_____

SIGNED _____

How To Use Your Renewal Parts Ordering Guide

1. Locate the part or parts to be replaced in one of the drawings in this manual. Refer to the usage code table below for drawings applicable to your breaker.
2. Identify each part by item number, description and part number. Give drawing figure number in which part is shown.
3. Include breaker type, rating and breaker serial number with your order.
4. Place your order with your Siemens representative.

Ordering Example

Type MA-250C1 Rated Amps 1200 Serial Number S-94203A-3

Parts Ordering Guide SG3188

Fig	Item	Description	Part Number	Quantity
1	3	Phase Barrier	71-118-091-003	1
1	34	Angle	71-114-834-001	2
2	2	Contact Assembly	71-112-913-502	1

If Required Part Is Not Identified In This Manual—

1. Make a copy of the drawing figure in which the part would appear.
2. Indicate with arrows or other markings location of part.
3. Describe or sketch required part.
4. Include breaker type, rating and breaker serial number with your order.
5. Place your order with your Siemens representative.

Usage Code Table

Type	Application	Operator	Top Level Assembly	Usage Code*
MA-250C1	1200 AMP	Stored Energy	18-468-576-604	B
MA-250C1	1200 AMP(80KA)	Stored Energy	18-468-576-605	C
MA-250C1	1200/2000 AMP	Stored Energy	18-468-576-606	D
MA-250C1	2000 AMP	Stored Energy	18-467-576-608	E
MA-250C1	2000 AMP (80KA)	Stored Energy	18-468-576-609	F
MA-350C1	1200 AMP	Stored Energy	18-469-221-601	H
MA-350C1	2000 AMP	Stored Energy	18-469-221-602	I
MA-350C1	1200/2000 AMP	Stored Energy	18-469-221-603	K

*If no usage code appears in the "Usage" column of the following parts lists, the part is used on all assemblies listed in the figure title.

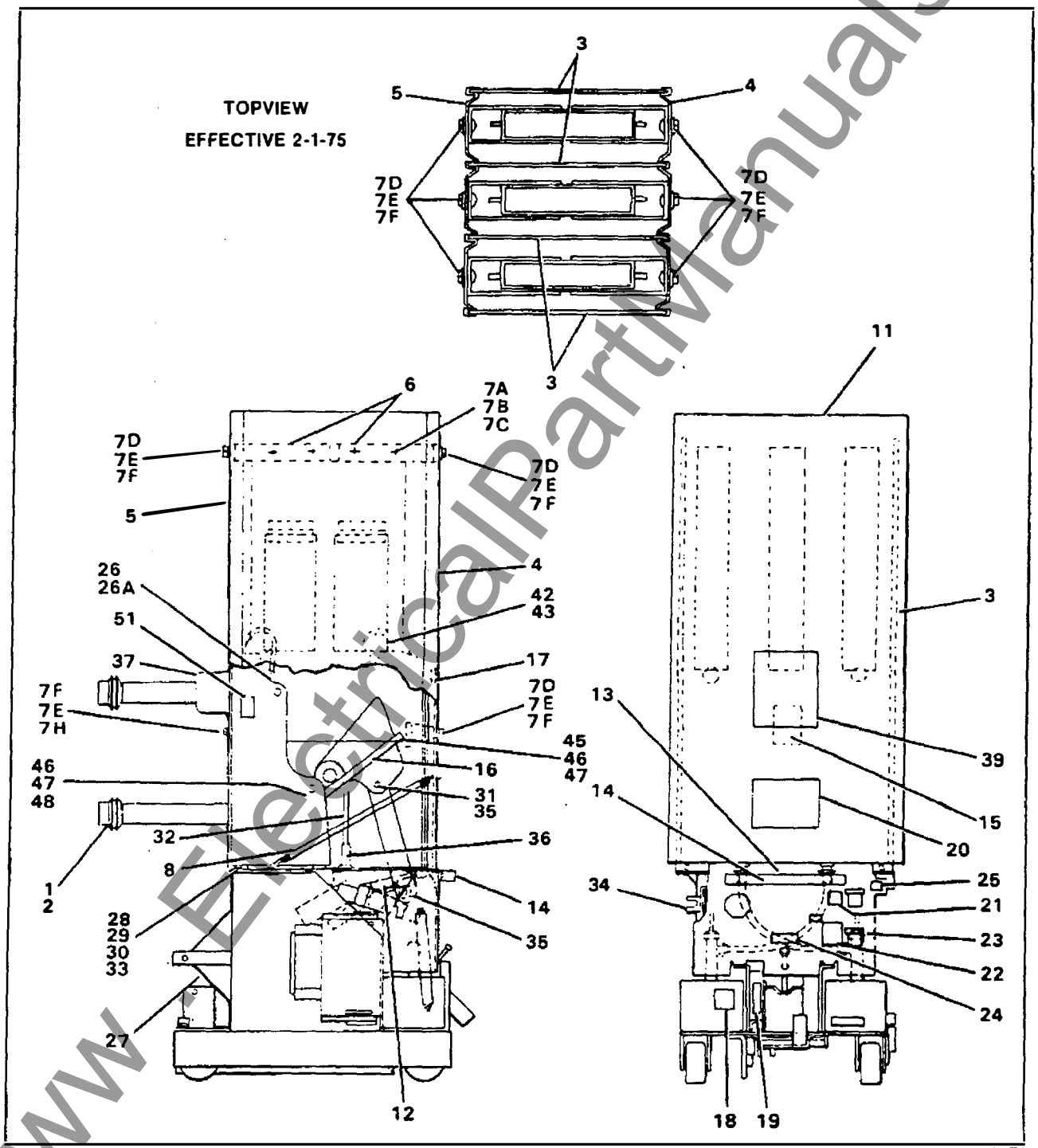


Figure 21. Type MA-250C1 Stored Energy Operated Breaker Assembly—Codes B through F (See Code Table, page 31)

Refer To Figure 21

Item	Description	Part Number	Usage
1	Contact Finger Assembly	18-723-565-502	EF
		18-657-456-579	BCD
2	Contact Finger Assembly	18-657-456-576	D
3	Phase Barrier—L.H.—Ctr.—R.H.	71-118-091-003	D
4	Front Barrier	18-723-598-002	
5	Rear Barrier	18-723-598-003	
6	Support	71-210-601-003	
7A	Hex Hd. Cap Scr.—.25 x 3.75 Lg.	00-611-315-397	
7B	Stover Locknut—.25	15-171-063-004	
7C	Roundwasher—.25	00-651-007-146	
7D	Hex Hd. Cap Scr.—.31 x 62 Lg.	00-611-315-417	
7E	Roundwasher—.31	00-651-007-900	
7F	Lockwasher—.31	00-655-017-030	
7G			
7H	Hex Hd. Cap Scr.—.31—24 x .75 Lg.	15-611-318-419	
8	Panel Spring	72-120-043-501	
11	Panel	71-208-897-001	
12	Spring	71-114-806-001	
13	Shield	18-389-101-001	
14	Handle	71-207-184-001	
15	Label	71-113-871-001	
16	Connector	18-657-765-241	
18	Indicator	71-111-259-001	
19	Indicator	71-111-260-001	
20	Serial No. Nameplate	18-723-585-	
		18-725-951-001	
21	Indicator—Closed	71-114-830-001	
22	Indicator—Open	71-114-830-002	
23	Arrow	71-117-508-001	
24	Indicator	71-167-932-001	
25	Counter	71-110-940-001	
26	Screw	00-615-114-371	
26a	Washer	00-655-017-026	
27	Frame & Operator	18-468-553-501	BDE
	(See Figure 4)	18-468-553-502	CF
28	Shim	71-109-843-001	
29	Shim	71-109-843-002	
30	Shim	71-109-843-003	
31	Link	71-113-440-003	
32	Tube	71-114-584-001	
33	Bolt	15-171-480-001	
34	Angle	71-114-834-001	
35	Pin	15-171-497-002	
36	Tube	71-114-860-001	
37	Stud and Support	71-401-833-502	B
	Assembly (See	71-401-833-515	C
	Figure 2)	71-401-833-511	D
		71-401-833-504	
		71-401-833-516	
		71-401-833-504	E
		71-401-833-516	F
38	Arc Chute (See Figure 3)	71-401-835-502	BCDEF
39	Label	71-114-320-001	
40	Screw (Plastic)	00-617-475-375	
41	Nut	15-171-033-002	
42	Pin	00-671-195-193	
43	Washer	00-651-007-900	
44	SA Decal	00-891-115-002	
45	Screw	00-611-315-375	
46	Lock Nut	15-171-063-004	
47	Round Washer	00-651-007-160	
48	Screw	00-611-315-380	
49	Strap	71-115-588-002	CF
50	Screw	00-615-124-424	CF
51	Warning Sign	18-395-300-115	

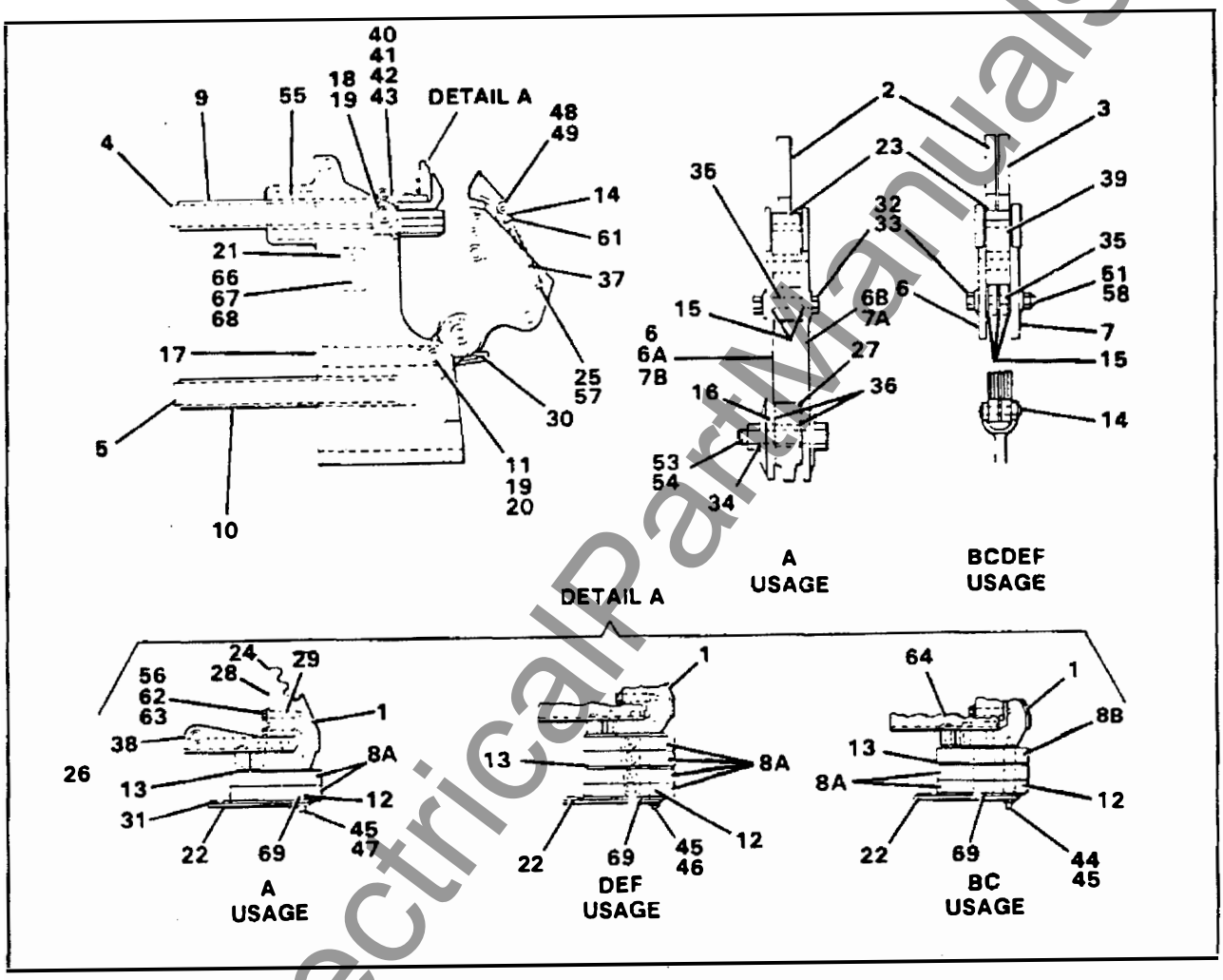


Figure 22. Stud and Support Assembly — Codes A through F (See Code Table, page 31)

Refer To Figure 22

Item	Description	Part Number	Usage
01	MA-75-150 1200 Amp	71-401-833-501	A
	MA-250 1200 Amp	71-401-833-502	B
	MA-250 1200 Amp 80 KA	71-401-833-515	C
	MA-250 1200/2000 Amp	71-401-833-511	D
	MA-250 2000 Amp	71-401-833-504	E
	MA-250 2000 Amp 80 KA	71-401-833-516	F
1	Contact Assembly	71-112-966-502	BCDEF
		71-112-966-501	A
2	Contact Assembly	71-112-913-502	BCDEFHI
		71-112-913-501	A
3	Contact Assembly	71-112-913-503	BCDEFHI
4	Top Stud Assembly	71-208-214-506	EFI
		71-208-214-509	C
		71-208-214-505	B
		71-208-214-510	B
		71-208-214-504	A
5	Lower Stud Assembly	71-209-087-501	EFI
		71-208-831-501	AB
		71-209-087-504	C
		71-209-087-502	D
6	Disc Arm Assembly	71-208-255-511	DEFI
		71-208-255-515	DEF
6A	Disc Arm Assembly	71-208-255-507	A
6B	Disc Arm Assembly	71-208-255-508	A
7	Disc Arm Assembly	71-208-255-512	DEFI
		71-208-255-516	DEF
7A	Disc Arm Assembly	71-208-255-509	BC
7B	Dics Arm Assembly	71-208-255-510	BC
8A	Contact Finger Assembly	18-657-372-501	
8B	Contact Finger Assembly	18-657-372-505	
9	Tube	71-115-598-001	DEF
		71-107-672-001	ABC
10	Tube	71-115-598-002	DEF
		71-107-672-010	ABC
11	Spacer	71-107-716-001	
12	Tubing	72-120-735-003	DEF
		72-120-735-001	A
		72-120-735-002	B
13	Plate	71-112-910-001	
14	Yoke	71-112-934-001	A
		18-657-777-565	BCDEF
15	Washer	71-177-196-005	A
		71-114-701-001	BCDEF
16	Tube	71-170-947-008	DEF
		71-170-947-007	ABC
17	Bracket	71-302-850-002	DE
		71-302-850-001	AB
		71-302-850-010	F
		71-302-850-009	C
18	Spacer	71-107-716-010	
19	Rod	71-107-724-001	

Item	Description	Part Number	Usage
20	Washer	71-916-922-002	
21	Block	18-657-824-250	
22	Plate	71-112-911-001	
23	Spacer	71-112-948-001	
24	Barrier	71-112-971-001	
25	Bar	71-113-038-001	A
26	Spacer	71-113-101-001	A
27	Strip	71-113-681-001	
28	Strip	71-114-147-001	
29	Insulation	71-114-148-001	
30	Support	71-114-547-001	
31	Washer	71-152-809-030	
32	Washer	71-158-647-015	
33	Belville Washer	71-140-901-001	
34	Washer	71-167-537-001	
35	Tubing	71-172-682-010	
36	Washer	71-177-196-003	
37	Spring	72-120-400-001	
38	Channel Assembly	18-657-377-501	
39	Roll Pin	00-671-176-350	
40	Screw	00-615-114-432	A
41	Screw	00-615-114-438	CDEF
42	Screw	00-615-114-440	B
43	Nut	15-171-063-006	
44	Screw	00-615-249-235	B
45	Washer	00-655-017-022	
46	Screw	00-615-249-239	CDEF
47	Screw	00-615-261-231	A
48	Cotter Pin	00-671-195-119	A
49	Pin	00-957-211-902	A
50	Screw	00-611-315-373	
51	Screw	15-611-318-428	
52	Screw	00-611-315-461	
53	Screw	15-611-318-556	ABC
54	Screw	00-611-318-558	DEF
55	Epoxy	00-331-531-014	CF
56	Screw	15-171-949-086	
57	Nut	15-171-063-006	
58	Nut	15-171-063-005	
59	Nut	15-171-063-008	
60	Pin	00-671-176-350	
61	Washer	00-651-007-900	
62	Washer	00-655-047-100	
63	Washer	00-655-017-022	
64	Washer	00-655-017-026	
65	Washer	00-651-017-913	
66	Screw	00-611-315-490	
67	Nut	15-171-063-011	
68	Washer	00-651-007-230	
69	Washer	00-651-017-913	

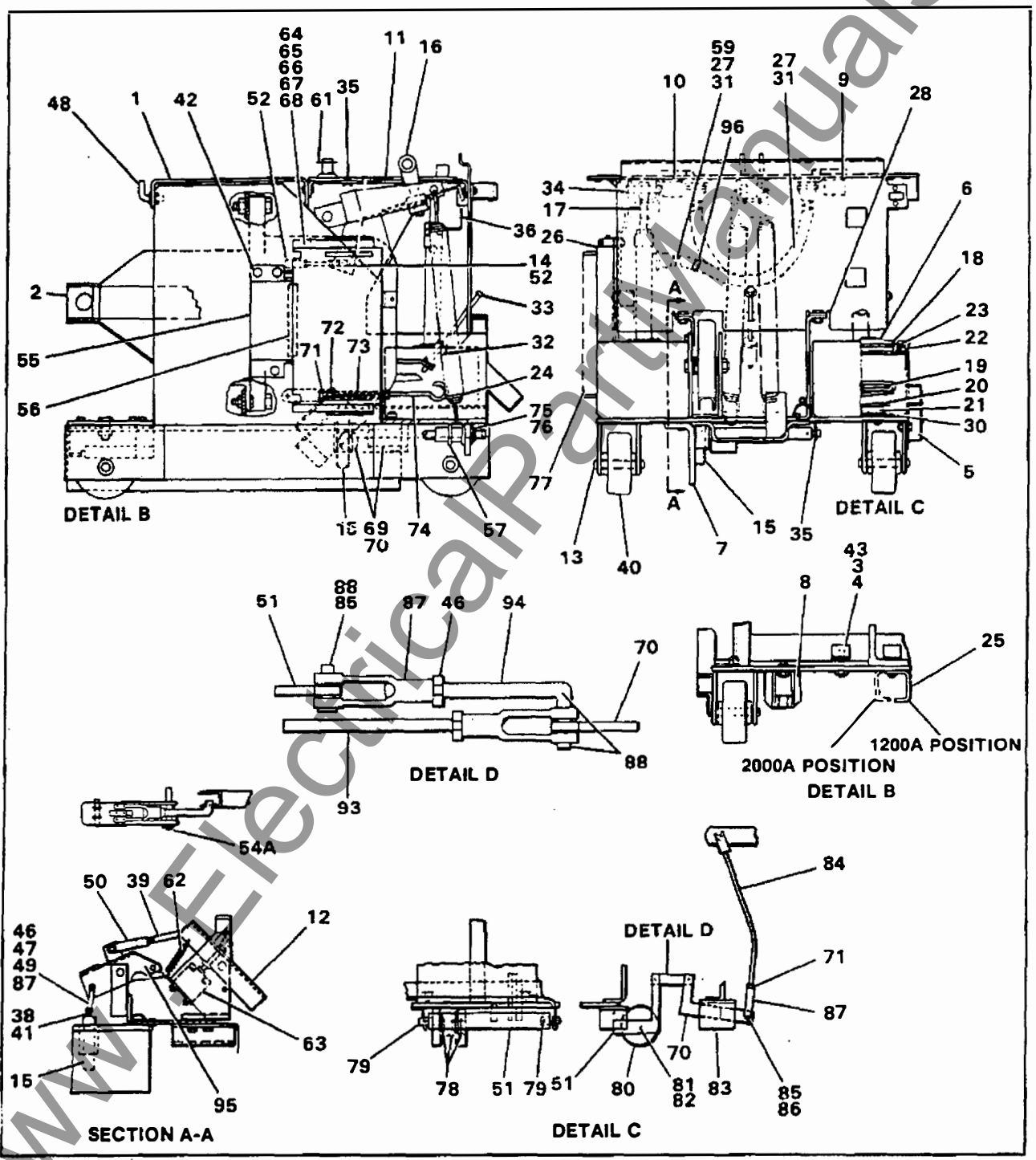


Figure 23. Type MA-250C1 and MA-350C1 Stored Energy Operator and Frame Assembly — Codes B through K (See Code Table, page 31)

Refer To Figure 23

Item	Description	Part Number	Usage
1	Frame & Operator Assembly	18-468-533-502	CFHIK
		18-468-553-501	ABDE
2	Operator Assembly	18-657-514-591	
3	Pad	71-116-231-001	CFHIK
4	Washer	71-163-273-002	CFHIK
5	Guide Assembly	71-208-910-501	
6	Piston Assembly	71-114-161-503	
7	Guide Assembly	71-114-765-501	
8	Grounding Contacts	71-114-787-502	
9	Bracket Assembly	71-116-800-501	
10	Bracket Assembly	71-116-800-502	
11	Plate	71-208-856-501	
12	Foot Pedal Assembly (Includes items 62 thru 69)	18-733-500-516	
13	Pin	71-104-754-034	
14	Rod	72-120-688-001	
15	Plunger	71-113-442-001	
16	Yoke End	71-113-487-002	
17	Rod End	71-113-541-001	
18	Spring	71-113-621-001	
19	Cup	71-114-151-002	
20	Compression Spring	71-114-153-001	
21	Bumper	71-114-154-001	
22	Cylinder	71-114-155-003	
23	Packing	71-114-156-001	
24	Spring	71-114-733-001	
25	Stop	71-114-749-002	
26	Link	71-114-752-001	
27	Tube	71-114-860-002	
28	Bracket	71-114-786-001	
30	Valve Disc	71-115-244-001	
31	Guard	71-118-452-001	
32	Compression Spring	71-140-125-001	
33	Pin	18-657-229-190	
34	Pin	15-171-497-001	
35	Rivet	00-671-501-030	
36	Indicator	72-120-190-001	
37			
38	Roll Pin	00-671-176-377	
39	Rod	72-120-594-001	
40	Wheel	15-171-067-002	
41	Eye End	00-696-713-102	
42	Bar	72-120-689-001	
43	Screw	00-615-055-428	CHIKF
45			
46	Nut	00-631-003-204	
47	Cotter Pin	00-671-195-049	
48	Screw	00-617-499-421	
49	Yoke	00-615-114-542	
50	Yoke	00-691-701-903	
51	Crank Assembly	18-724-395-501	
52	Ball Joint	00-833-573-003	
54A	Nut	15-171-063-006	
55	Aux. Switch	71-208-922-505	
56	Channel	72-120-062-001	
57	Clamp	15-171-386-002	
59	Clamp	15-171-070-002	
60	Cement	00-331-121-063	
61	Clamp	15-171-070-001	
62	Spring	71-113-502-001	
63	Switch	00-871-351-107	
64	Channel	18-657-852-564	
65	Shim	72-120-273-001	
66	Slide	18-657-852-563	
67	Angle	72-120-570-001	
68	Pin	72-120-687-001	
69	Bracket	72-220-113-501	
70	Crank Assembly	18-723-507-501	
71	Nut	00-631-003-204	
72	Nut	00-633-025-216	
73	Spring	71-204-604-028	
74	Pull Rod	18-657-522-262	
75	Nut	00-855-759-104	
76	Flex Shaft Support	18-657-523-335	
77	Sec. Disconnect Assembly	72-120-237-501	
78	Washer	71-152-908-002	
79	Roll Pin	00-671-176-189	Assembly 18-723-584-502
80	Roller	72-120-706-001	
81	Bolt	00-611-343-030	
82	Nut	00-633-025-220	
83	Bracket	18-723-506-001	
84	Push Rod	18-723-509-503	
85	Pin	00-957-211-901	
86	Pin	00-671-195-119	
87	Yoke End Adj.	00-691-701-901	
88	Pin	00-671-195-049	
89	Pin	00-957-221-010	
90	Pin	00-671-195-119	
91	Link	18-657-767-327	
92	Pin	15-171-181-002	
93	Pull Rod	18-657-522-262	
94	Rod	71-109-216-019	
95	Rod	72-120-329-001	
96	Ty Rap	00-857-271-105	
97	Tube	71-114-860-001	
98	Cement	00-331-121-063	

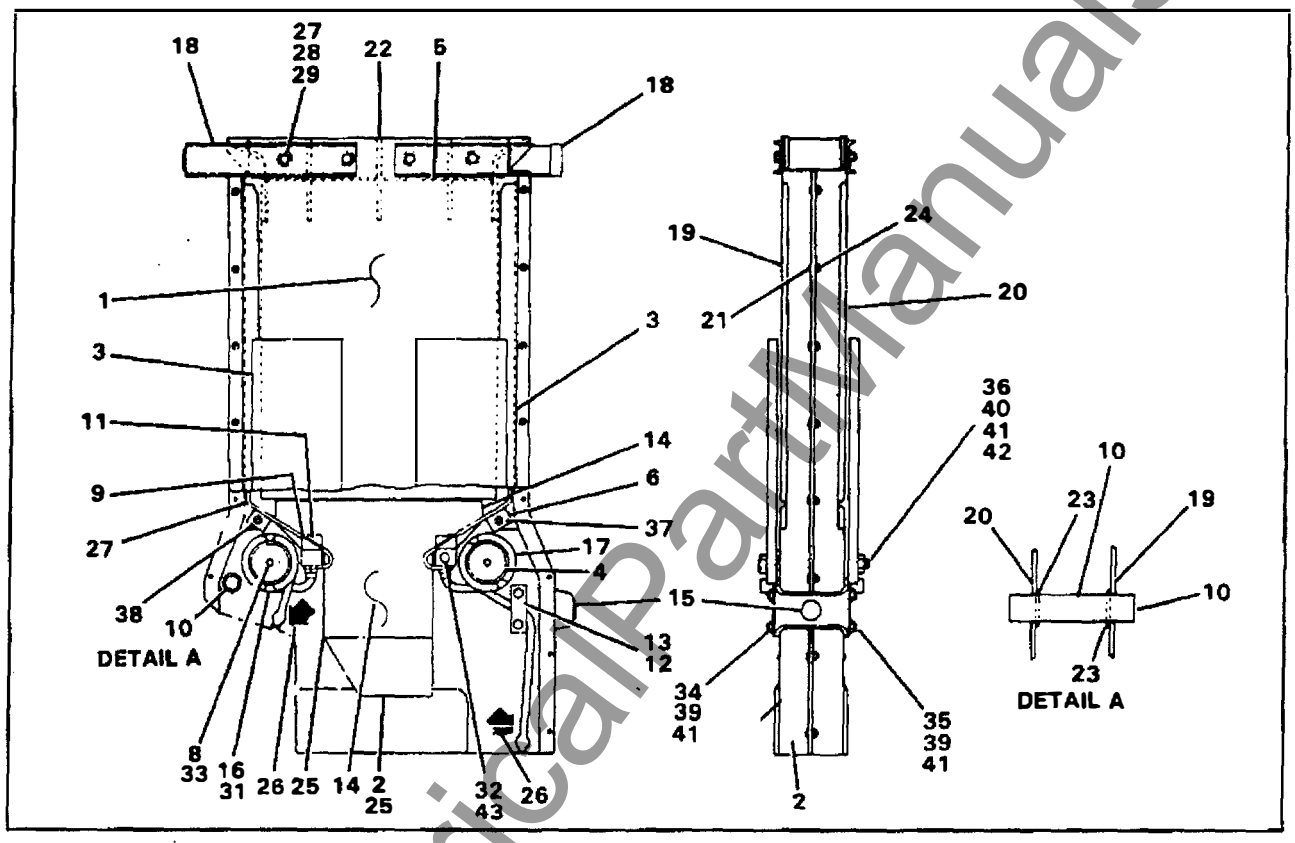


Figure 24. Type MA-250C1 Arc Chute Assembly

Item	Description	Part Number	Usage
1	Arc Chute Assembly	71-401-835-502	
2	Plate	18-657-782-090	
3	Pole Piece	71-114-575-501	
4	Core	71-200-806-503	
5	Barrier Stack	71-208-818-502	
6	Block	71-114-476-001	
7	Arc Runner	71-114-577-001	
8	Screw	71-114-586-001	
9	Block	71-115-470-001	
10	Pin	71-115-471-001	
11	Tape	71-115-472-001	
12	Washer	71-170-790-006	
13	Insulation	71-176-201-002	
14	Shield	71-208-812-001	
15	Bracket	71-208-817-001	
16	Rear Coil	71-208-860-001	
17	Front Coil	71-208-861-001	
18	Support	71-210-601-003	
19	Channel	71-302-881-001	
20	Channel	71-302-881-002	
21	Screw	00-615-662-900	
22	Barrier	18-394-426-509	

Effective 2-1-75

Item	Description	Part Number	Usage
23	O-Ring	15-751-551-001	
24	Nut	00-633-039-210	
25	Adhesive	15-333-031-002	
26	Arrow Label	15-171-120-004	
27	Screw	00-611-315-397	
28	Nut	15-171-063-004	
29	Washer	00-651-007-146	
30	Cement	00-331-121-063	
31	Tape	00-479-411-900	
32	Screw	00-611-315-377	
33	Washer	00-651-007-160	
34	Washer	00-611-315-419	
35	Washer	00-611-315-424	
36	Washer	00-611-315-490	
37	Tap Screw	00-615-644-218	
38	Tap Screw	00-615-413-218	
39	Locknut	15-171-063-006	
40	Locknut	15-171-063-007	
41	Washer	00-651-007-900	
42	Washer	00-651-007-214	
43	Washer	00-655-017-026	

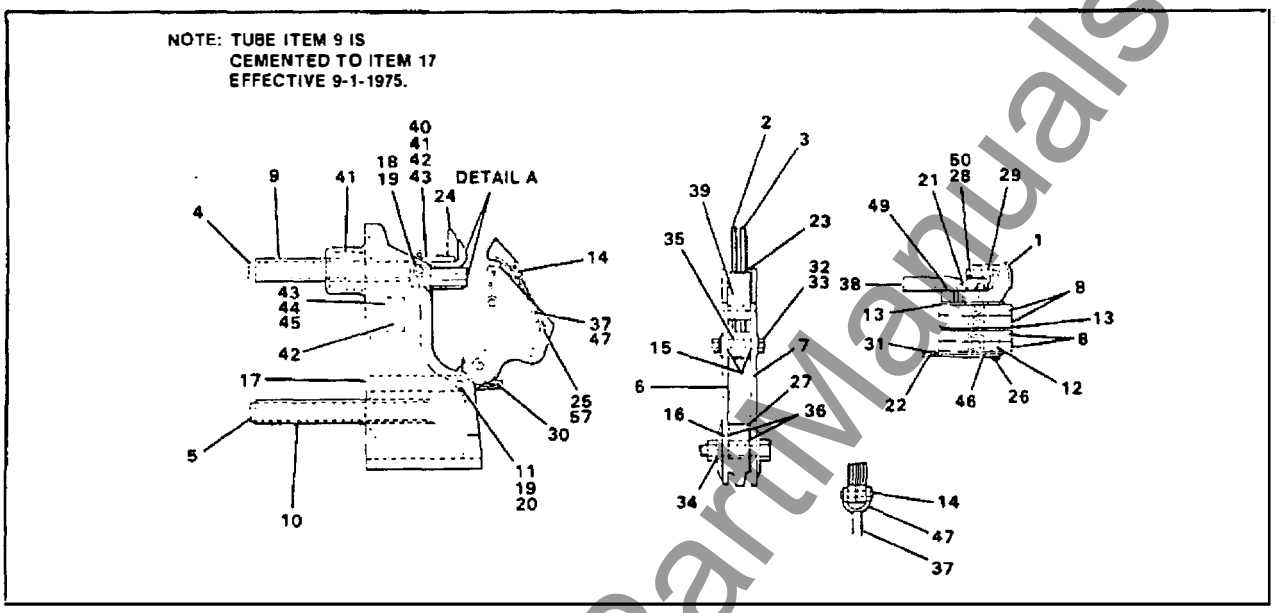


Figure 25. Type MA-350C1 Stud and Support Assembly — Codes H, I, & K (See Code Table, Page 31)

Item	Description	Part Number	Usage
01	Stud & Support Assembly	71-401-833-513	H
02	Stud & Support Assembly	71-401-833-514	I
1	Contact Assembly	71-112-966-502	
2	Contact Assembly	71-112-913-502	
3	Contact Assembly	71-112-913-503	
4	Top Stud Assembly	71-208-214-506	I
		71-208-214-509	H
5	Lower Stud Assembly	71-209-087-504	H
		71-209-087-501	I
6	Disc Arm Assembly	71-208-255-511	IK
		71-208-255-515	H
7	Disc Arm Assembly	71-208-255-512	IK
		71-208-255-516	H
8	Contact Finger Assembly	18-657-372-501	H
9	Tube	71-115-598-001	IK
		71-107-672-001	H
10	Tube	71-115-598-002	IK
		71-107-672-010	H
11	Spacer	71-107-716-001	
12	Tubing	72-120-735-003	
13	Plate	71-112-910-001	
14	Yoke	18-657-777-565	
15	Washer	71-114-701-001	
16	Tube	71-170-947-007	
17	Bracket	71-302-850-007	H
		71-302-850-008	IK
18	Spacer	71-107-716-010	
19	Rod	71-107-724-001	
20	Washer	71-916-992-002	
21	Screw	00-611-315-373	
22	Plate	71-112-911-001	
23	Spacer	71-112-948-001	

Item	Description	Part Number	Usage
24	Barrier	71-112-971-001	
25	Bar	71-113-038-001	
26	Screw	00-615-249-239	
27	Strip	71-113-681-002	
28	Strip	71-114-147-001	
29	Insulation	71-114-148-001	
30	Support	71-114-547-001	
31	Washer	71-152-809-030	
32	Washer	71-158-647-015	
33	Belville Washer	71-140-901-001	
34	Washer	71-167-537-001	
35	Tubing	71-172-682-010	
36	Washer	71-177-196-003	
37	Spring	72-120-400-001	
38	Channel Assembly	18-657-377-501	
39	Roll Pin	00-671-176-350	
40	Bolt	15-611-318-556	H
		00-611-318-558	IK
41	Epoxy	00-331-531-014	
42	Support	18-657-824-250	
43	Screw	00-611-315-490	
44	Nut	15-171-321-001	
45	Washer	00-651-007-230	
46	Washer	00-651-017-913	
47	Washer	00-651-007-900	
48	Nut	15-171-063-006	
49	Screw	00-615-114-440	
50	Screw	15-171-949-086	
	For K Usage Code Add:		
03	Stud & Support	71-401-833-517	K
04	Top Stud	71-208-214-510	K
05	Lower Stud	71-209-087-502	K

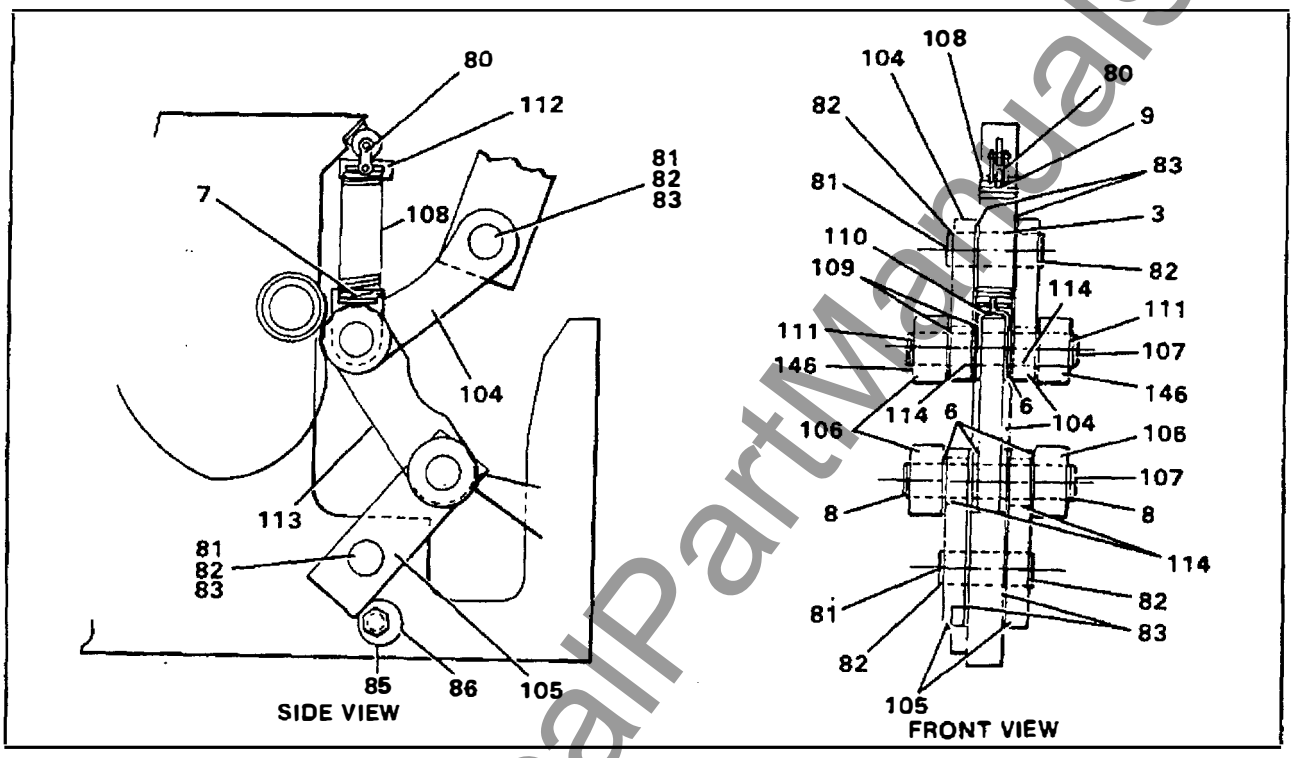


Figure 26. Type 515-1 Stored Energy Operator Assembly — VIEW A

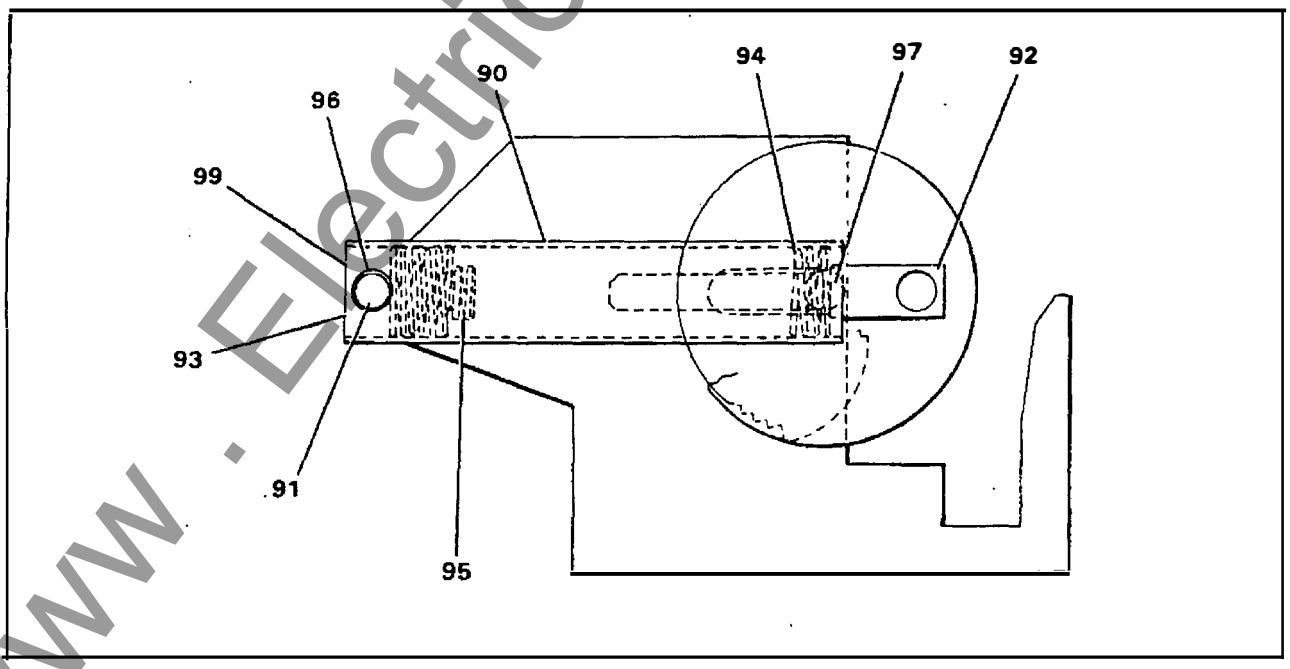


Figure 26. VIEW B

Refer To Figure 26 A & B

Item	Description	Part Number	Usage
3	Needle Bearing	00-813-119-814	
6	Stop Bracket Assembly	18-657-852-582	
7	Shaft	18-657-467-291	
8	Split Spacer	18-657-800-113	
9	Collar	18-657-467-290	
80	Chain Link	00-831-349-065	
81	Pin	18-657-464-105	
82	Retaining Ring	00-673-165-075	
83	Washer	71-152-809-026	
85	Stop	18-657-464-118	
86	Washer	00-655-067-200	
90	Spring Retainer	18-657-589-038	
91	Shaft	18-657-463-369	
92	Drive Block	18-657-942-303	
93	Shaft Support	18-733-219-001	
94	Spring	15-171-833-001	
95	Spring	15-171-836-001	
96	Retaining Ring	00-673-165-100	
97	Retaining Ring	00-673-165-087	
99	Screw	00-615-114-556	
104	Link	71-114-297-001	
105	Link	18-657-464-103	
106	Roller	15-813-073-001	
107	Pin	18-657-464-104	
108	Spring	18-657-523-331	
109	Washer	71-152-809-026	
110	Spring Holder	18-657-523-332	
111	Retaining Ring	00-673-165-075	
112	Spring Anchor	18-657-523-333	
113	Link	18-657-800-115	
114	Needle Bearing	00-813-119-813	
146	Bearing	18-657-895-590	

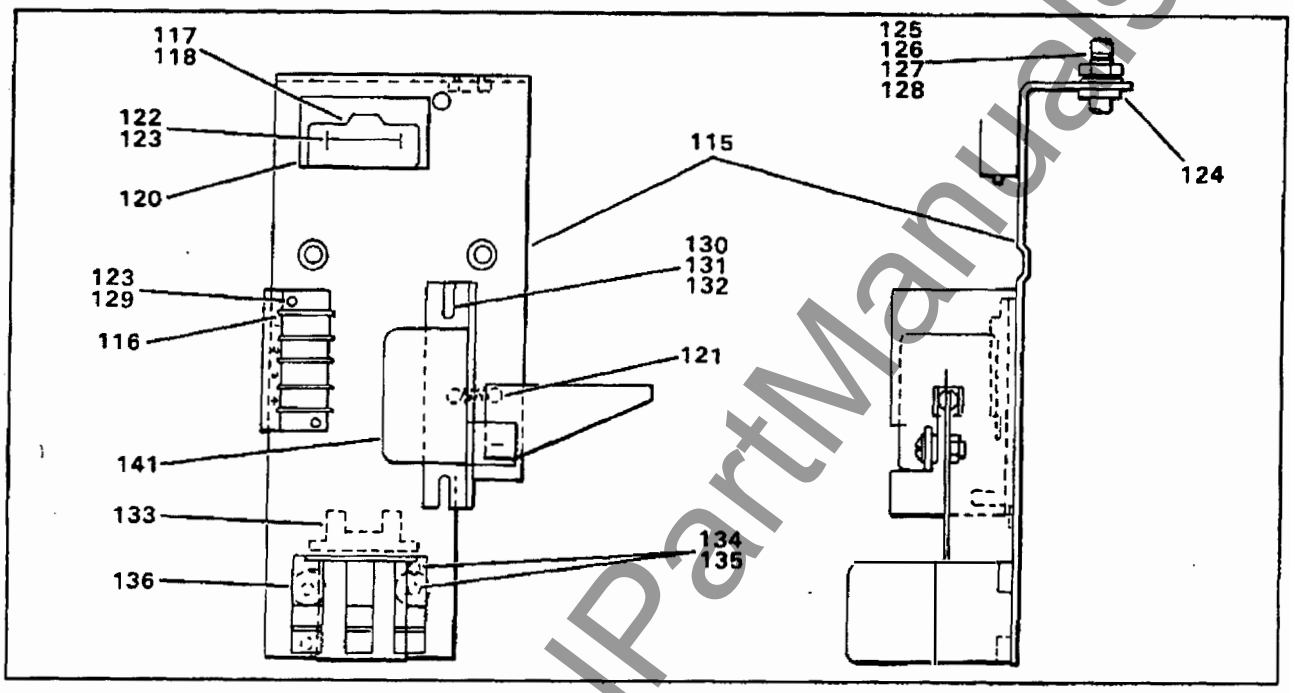


Figure 26. VIEW C

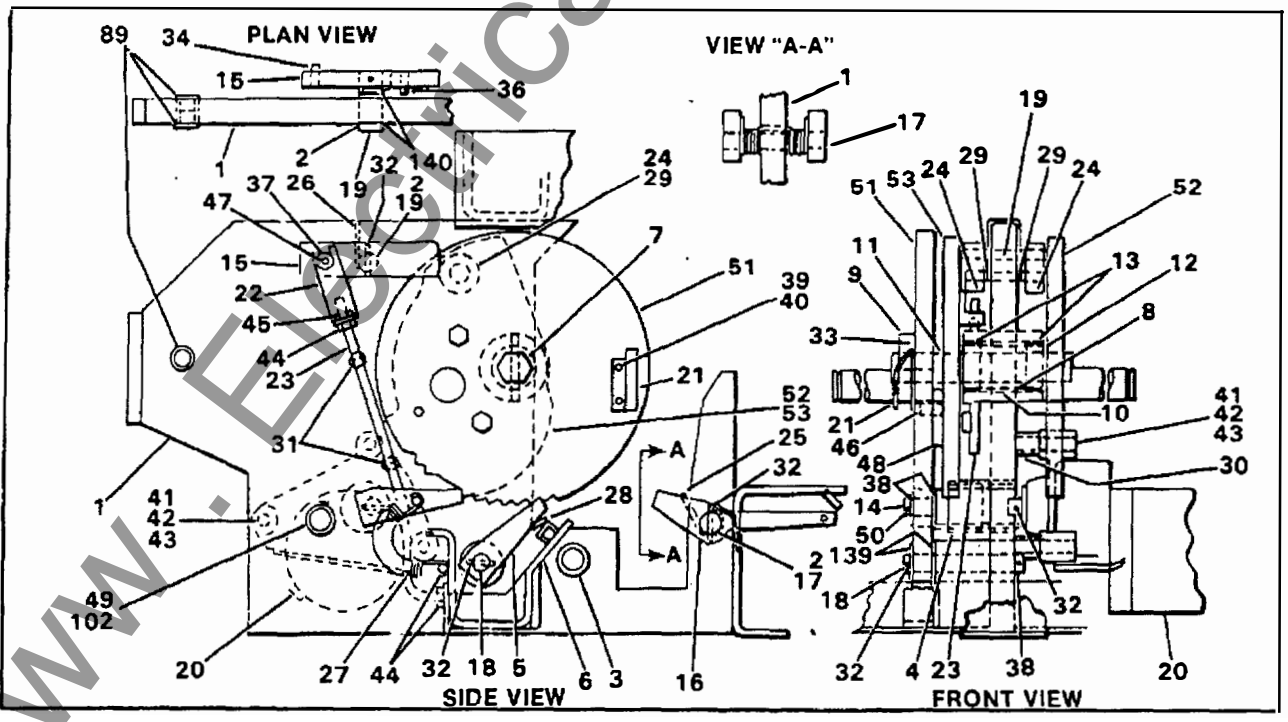


Figure 26. VIEW D, Frame And Drive Assy.

Refer To Figure 26 C & D

Item	Description	Part Number	Usage
1	Frame Assembly	18-469-102-501	
2	Needle Bearing	00-813-119-810	
3	Needle Bearing	00-813-119-814	
4	Needle Bearing	00-813-119-821	
5	Pawl Assembly	18-657-485-536	
6	Stop Bracket Assembly	18-657-852-582	
7	Shaft	18-657-467-291	
8	Slit Spacer	18-657-800-291	
9	Collar	18-657-467-290	
10	Inner Race**	18-657-467-335	
11	Spacer	18-158-935-009	
12	Thrust Washer	00-815-225-131	
13	Needle Bearing	15-813-119-003	
14	Pin	18-657-463-368	
15	Stop Latch	18-657-463-388	
16	Trip Latch	18-675-463-390	
17	Pin	18-657-464-012	
18	Pin	18-657-523-064	
19	Shaft	18-657-463-389	
20	Motor*	18-469-223	
21	Charge Disc. Actuator	18-657-522-305	
22	Bracket	18-657-522-304	
23	Interlock Rod	18-657-522-269	
24	Roller Bearing	15-813-073-003	
25	Torsion Spring	18-657-466-081	
26	Torsion Spring	18-657-466-080	
27	Pawl Return Spring	18-657-229-240	
28	Compression Spring	15-837-321-008	
29	Retaining Ring	00-673-165-062	
30	Spacer	13-158-935-011	
31	Adj. Screw	00-617-499-375	
32	Roll Pin	00-671-176-194	
33	Roll Pin	00-671-176-325	
34	Roll Pin	00-671-176-383	
36	Roll Pin	00-671-171-375	
37	Washer	18-657-522-303	
38	Washer	15-171-091-005	
39	Screw	00-516-245-218	
40	Lockwasher	00-655-017-022	
41	Screw	00-611-315-392	
42	Washer	00-651-007-160	
43	Lockwasher	00-655-017-026	

Item	Description	Part Number	Usage
44	Elastic Stop Nut	00-633-025-116	
45	Jam Nut	00-631-143-104	
46	Roll Pin	00-671-176-373	
47	Roll Pin	00-671-171-379	
48	Spacer	18-657-523-278	
49	Flex Shaft Support	18-657-523-335	
50	Roll Pin	00-671-176-189	
51	Ratchet Assembly	18-390-202-501	
52	Cam Assembly	18-389-061-501	***
53	Cam Assembly	18-389-061-502	
89	Grommet	00-691-872-130	
102	Clamp	15-171-386-002	
115	Plate	18-723-641-001	
116	Terminal Block	00-857-036-012	Close
117	Microswitch*	15-171-323-001	Latch
118	Microswitch*	15-171-323-002	Check
120	Shield	18-657-468-090	
121	Extension Spring	18-657-523-061	
122	Screw	00-615-471-130	
123	Washer	00-655-047-060	
124	Nut	14-147-052-002	
125	Screw	00-617-247-470	
126	Nut	00-631-171-106	
127	Washer	00-655-017-032	
128	Washer	00-651-007-230	
129	Screw	00-615-471-124	
130	Screw	00-615-485-216	
131	Washer	00-655-017-022	
132	Washer	00-651-007-907	
133	Relay Anti-Pump	00-871-797-107	125V DC
		00-871-797-108	250V DC
		00-871-797-109	48V DC
		00-871-797-115	24V DC
134	Washer	00-655-047-080	
135	Screw	00-615-223-174	
136	Relay Anti Pump	15-171-405-001	240V AC
		15-171-405-002	120V AC
139	Washer	71-163-273-001	
140	Washer	71-140-443-001	
141	Motor Cutoff Sw.	18-739-827-502	125 V AC&DC
			230V AC
		18-394-426-544	240V DC

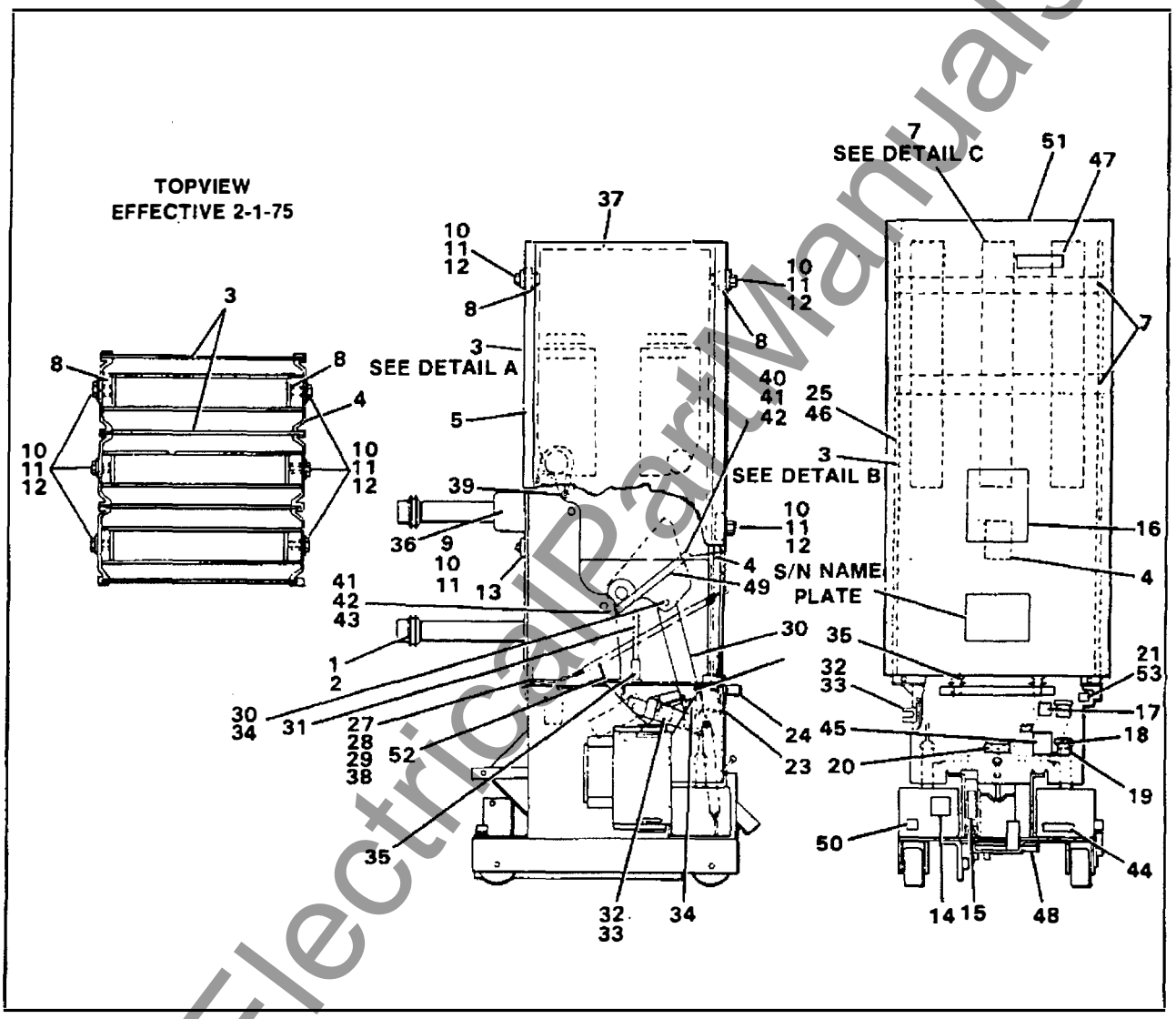


Figure 27. Type MA-350C1 Stored Energy Operated Breaker Assembly 1200 AMP (Code H) and 2000 AMP (Code J) (See Code Table, page 31) 1200/2000 Code K

Refer To Figure 27

Item	Description	Part Number	Usage
1	Contact Finger Assembly	18-657-456-579	H
2	Contact Finger Assembly	18-723-565-502	I
	Contact Finger Assembly	18-657-456-576	K
3	Phase Barrier—L.H.—Ctr—R.H.	71-118-091-003	
4	Front Barrier	18-723-598-004	
5	Rear Barrier	18-723-598-005	
6	Conn.	18-657-765-241	
7	Gasket	00-437-051-031	
8	Block	71-116-188-001	
9	Soc. Hd. Cap Scr. .31 x 1.25 Lg.	00-615-124-424	
10	Roundwasher—.31	00-651-007-900	
11	Lockwasher—.31	00-655-017-030	
12	Hex Hd. Cap Scr.—.31 x .62 Lg.	00-611-315-417	
13	Strap	71-115-588-002	
14	Indicator	71-111-259-001	
15	Indicator	71-111-260-001	
16	Label	71-114-320-001	
17	Indicator—Closed	71-114-830-001	
18	Indicator—Open	71-114-830-002	
19	Arrow	71-117-508-001	
20	Indicator	71-167-932-001	
21	Counter	71-110-940-001	
22	Spring	71-114-806-001	
23	Shield	18-389-101-001	
24	Handle	71-207-184-001	
25	Nut	15-171-033-002	
26	Frame & Operator (See Figure 4)	18-468-553-502	
27	Shim	71-109-843-001	
28	Shim	71-109-843-002	
29	Shim	71-109-843-003	
30	Link	71-113-440-003	
31	Tube	71-114-548-001	
32	Shim	71-114-833-001	
33	Angle	71-114-834-001	
34	Pin	15-171-497-002	
35	Tube	71-114-860-001	
36	Stud & Supprot	71-401-833-513	H
	(See Figure 2)	71-401-833-514	I
		71-401-833-517	K
37	Arc Chute Assembly (See Figure 7)	71-401-838-501	
38	Bolt	15-171-480-001	
39	Screw	00-615-114-371	
40	Screw	00-611-315-375	
41	Nut	15-171-063-004	
42	Washer	00-651-007-160	
43	Screw	00-611-315-382	
44	Label	71-114-294-001	
45	Label	15-171-083-030	
46	Screw	00-617-475-375	
47	SA Decal	00-891-115-002	
48	Twin Roller	18-723-584-502	K
49	Connector	71-114-708-001	
50	Label	71-117-705-001	
51	Panel	71-208-971-001	
52	Spring	72-120-043-501	
53	Spring	71-114-806-001	

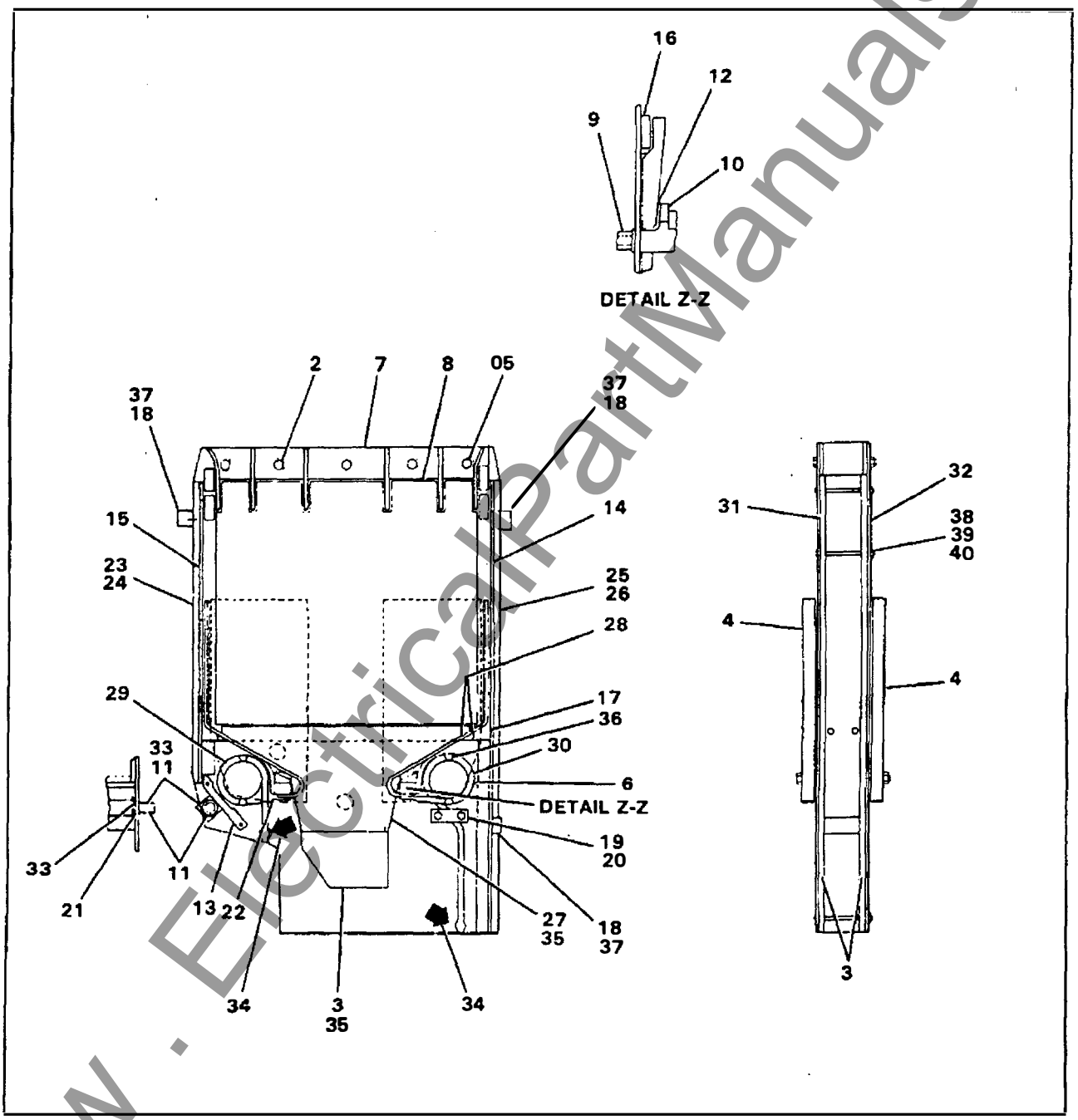


Figure 28. Type MA-350C1 Arc Chute

Refer To Figure 28

Item	Description	Part Number	Usage
1	Arc Chute	71-401-838-501	
2	Screw	00-611-315-396	
3	Plate	18-675-782-090	
4	Pole Piece	71-116-147-501	
5	Screw	00-611-315-396	
6	Core	71-200-806-505	
7	Barrier	71-209-332-501	
8	Barrier Stack	71-303-065-501	
9	Screw	71-114-586-001	
10	Block	71-115-470-001	
11	Pin	18-657-524-051	
12	Tape	71-115-472-001	
13	Shield	18-657-658-515	
14	Plate	71-116-185-001	
15	Plate	71-116-185-002	
16	Strip	71-116-186-001	
17	Block	71-116-187-001	
18	Block	71-116-188-001	
19	Washer	71-170-790-006	
20	Insulation	71-176-201-002	
21	O-Ring	15-751-551-001	
22	Band	71-915-843-006	
23	Strip	71-209-359-001	
24	Strip	71-209-359-002	
25	Strip	71-209-359-003	
26	Strip	71-209-359-004	
27	Shield	71-209-360-001	
28	Arc Runner	71-209-361-001	
29	Rear Coil	71-209-389-001	
30	Front coil	71-209-390-001	
31	Plate	71-303-072-001	
32	Plate	71-303-072-002	
33	Screw	00-615-413-220	
34	Arrow	15-171-120-004	
35	Adhesive	15-333-031-002	
36	Tape, ¾"	00-479-411-900	
37	Screw	00-615-644-218	
38	Screw	15-615-471-002	
39	Nut	00-633-039-110	
40	Washer	00-651-017-902	